EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-01

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Model, Machine & Fabrication S

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
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5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 Cost/Fee: LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: Cost/Fee: LOE:

Cumulative Approved: Cost/Fee: LOE:

Work Assignment Manager Name: Richard Valentine (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4437 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates (Signature) 3-25-14 (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Statement of Work
For EP-C-09-027 WA 5-01
Model, Machine, and Fabrication Shop Support

Purpose : This Work Assignment shall provide shop support for research and development projects at EPA/RTP/NRMRL/APPCD, NERL, NHEERL, AND NHSRC.

Statement of Work : The Contractor shall provide technical and trade support for pilot scale, bench scale, and process measurement instrumentation including design, fabrication, modification and repair of research and development equipment and facilities. Examples of support include preparation of custom designs and layouts for innovative sampling apparatus and instrumentation, and installation or repair of pollution control equipment such as combustors, baghouses, diesel engines, refrigeration equipment, dynamometers, wind tunnels, and HVAC or building utility systems.

The Contractor shall provide machinists, fabricators, and other trade personnel skilled in the fabrication of research equipment from raw materials such as stainless steel, aluminum, Plexiglas, Teflon, sheet metal, PVC, wood, or rubber. The Contractor shall outfit or modify research vehicles as directed by the WAM.

The Contractor shall provide technicians skilled in the design, acquisition, fabrication and assembly of structural steel used to support sampling and analytical equipment for above-grade air pollution research and development. Such platforms and associated framework would become part of the permanent infrastructure for all types of on-site atmospheric testing.

The Contractor shall operate specialized equipment in the NRMRL/APPCD Machine and Fabrication Shop. Typical skills include machining, welding, cutting, plumbing, carpentry, and assembly of technical apparatus into working systems. The Contractor shall provide machinists skilled in the use of engine lathes, milling machines, Computer Numeric Controlled (CNC) machines, saws, drill presses, and other standard machine shop equipment. The Contractor shall provide licensed electricians for power wiring of equipment and circuitry as follows :

The Contractor shall provide technician support for design, fabrication, and assembly of complex electronic circuitry including personal computer hardware, operating systems, breadboards, printed circuit boards, and networks. Contractor technician shall have experience with schematic drawings, test equipment such as multi-meters, signal generators, and oscilloscopes. Contractor shall have experience in fabricating custom electronic devices and cables as well as experience in the repair of scientific instrumentation such as gas analyzers, chromatographs, data acquisition systems, and laboratory equipment such as ovens. Contractor shall have specialized experience in troubleshooting and repair of industrial electric/electronic controls and computer-to-instrument interfaces such as RS232 and USB.used on pilot and bench scale scale equipment.

The Contractor shall maintain Government-furnished equipment in proper working condition. Repairs and maintenance of such equipment shall be coordinated with the WAM.

The Contractor shall provide the WAM with weekly electronic time accounting which shall include the Branch/organization for whom the work was performed.

The Contractor shall adhere to all EPA and local Health and Safety regulations, observe good working practice, and operate in accordance with EPA/RTP's Environmental Management System (EMS) policies and the RTP Chemical Hygiene Plan.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-02

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	GHG and HAP Measurements Metho

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2):

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Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Jeff Ryan (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-1437 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name: (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Statement of Work
for
GHG and HAP Measurements Methods Development Support to Program Offices

Project Description:

With the implementation of ORD's Path Forward initiative, the Air, Climate, Energy (ACE) research component includes targeted research specifically to support the Program Office's and their emissions measurement methods development needs. This WA is intended to support several research "Tasks" (ACE Tasks 222, 096, and 224) identified in the ACE Research Action Plan. Moreover, this WA is intended to implement research that encompasses multiple OAR emissions measurement methods development topics and needs.

These include:

- Performance of hydrochloric acid (HCl) continuous emission monitors (CEMs) to support regulatory compliance applications
- Performance of HCl Reference Methods as they pertain to HCl monitoring certifications
- Evaluation of Hg and HCl NIST traceable gases to support regulatory compliance
- Performance of nitrous oxide (N_20) CEMs to support Greenhouse Gas (GHG) monitoring
- Evaluation of Fourier Transform Infrared (FTIR) for the measurement/monitoring of organic and inorganic Hazardous Air Pollutants (HAPs)
- Evaluation of innovative measurement/monitoring approaches and technologies
- Evaluation of mercury (Hg) measurement quality issues associated with the utility industry practice of coal bromine addition for Hg control
- Evaluation of EPA's Method 26A ability to quantify and speciate HBr and Br_2 emissions in combustion systems
- Resolution of the fundamental discrepancy between elemental (Hg^0) and oxidized ($HgCl_2$) NIST traceable reference gases.

The purpose of this WA is to conduct research that targets the regulatory research needs identified above. This research support is expected to require laboratory and pilot-plant testing in order to fully understand the quality of the measurement technologies under investigation. An additional purpose of this WA is to support maintenance and operations of the Multipollutant Control Research Facility (MPCRF). Due to the considerable and lengthy maintenance requirements occurring in FY 2013, many of the same project objectives remain in FY 2014.

Project Objectives:

The primary objective of this project, and therefore the primary level of effort in the WA, is to demonstrate the readiness and quantitative measurement performance of commercially available, HCl and N_2O gas analyzers or CEMs for point source monitoring and compliance measurement application. For HCl CEMs, the primary focus is the quality of low level (~ 2 ppm) measurements associated with emissions from coal-fired power plants and cement and lime kilns. A desired outcome of this work is to generate data that will support the formal development of HCl monitoring procedures. Another major objective of this project, is to assess the suitability of existing

monitoring (i.e., PS-2, Part 75) and instrumental Reference Method (i.e., Method 7E, Method 320, ASTM D 6348-03) approaches that can be used to establish formal EPA, N_2O-specific monitoring specifications and procedures and Reference Methods that can be used to support GHG regulatory actions.

Another major objective of this WA is to continue to determine the potential suitability of FTIR, as well as other innovative monitoring technologies, as a regulatory compliance monitoring tool for organic HAPs. Formaldehyde, benzene and acrolein are of primary interest. Technology sensitivity (detection limits), proper wavelengths for quantitation, spectral interferences, status and availability of calibration standards are examples of associated considerations. It is anticipated that this work shall require a combination of theoretical and empirical information gathering including some pilot-plant testing on the MPCRF. An additional objective is to consider potential changes to Method 320 so that a revised version can be proposed.

Another objective of this WA is to examine the impact on the quality of regulatory compliance Hg emissions measurements where bromine is added to coal prior to combustion to enhance Hg control. This process results in the presence of bromine (HBr and Br_2) in the stack gas which has the potential to impact the quality of compliance measurements, particularly those made by Hg CEMS. A component of this research will include the development/evaluation of HBr and Br_2 measurement methods.

This WA is a continuation of WA 4-02.

Statement of Work:

TASK 1. Work Plan, Reporting, Budget, And WA Management

The contractor shall prepare and deliver to the WA manager (WAM) a work plan and budget within 20 days of WA effective date. The work plan must include a description of how the contractor shall accomplish each task, along with a breakdown of level of effort by professional level per task; a cost breakdown per task, and any underlying assumptions used. The contractor shall conduct activities necessary to manage the WA, including at least weekly communication with the EPA WAM.

TASK 2. Preparation of WA QAPP(s)

Though a QAPP was prepared and submitted as part of WA 4-02 for the HCl testing, several additional individual QAPPs are anticipated (e.g, N_2O monitoring methods). These QAPPs shall be developed according to the requirements in Appendix #1 to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

TASK 3. Pilot-Plant Testing of HCl CEMs

The contractor shall conduct testing on EPA's Multi-Pollutant Combustion Research Facility (MPCRF) to evaluate the quantitative measurement performance of HCl CEMs under actual and varied combustion conditions. Tests shall consider natural gas and coal combustion conditions as a minimum. Quantitative performance of the HCl CEMs shall include use of EPA Reference Methods (including use of FTIR) as comparative references. Emphasis shall include the lowest concentrations that can be measured reliably. Concentrations in the 0.5 to 2 ppm range are of primary interest. The candidate HCl CEMs technologies shall be as representative as possible of those commercially available. The contractor will be responsible for obtaining the HCl CEMs to be tested. The purchase or leasing of HCl CEMs shall be considered. At least 4 different HCl CEMs are desired to be tested. (Target Completion – 6/30/14)

TASK 4. Pilot-Plant Testing of N_20 CEMs

The contractor shall conduct laboratory and pilot-scale combustor testing to characterize the measurement performance of candidate N20 analyzers. These characterizations shall focus on spectral interference test approaches such as that found in 40 CFR Part 60 Method 7E. Testing shall be conducted with simulated and actual emission environments (e.g., fossil fuel combustion). Emphasis shall also include the lowest concentrations that can be measured reliably as well as concentrations anticipated at Adipic and Nitric Acid plants. The candidate N_2O CEMs technologies shall be as representative as possible of those commercially available. The contractor will be responsible for obtaining the N_2O CEMs to be tested. The purchase or leasing of N_2O CEMs shall be considered. At least 4 different N_2O CEMs are desired to be tested. The contractor shall also determine the feasibility of including an FTIR as part of these tests. (Target Completion – 9/30/14)

TASK 5. Combustion Testing of VOC Measurement/Monitoring Technologies

The contractor shall conduct laboratory and pilot-scale combustor testing to characterize the measurement performance of candidate VOC measurement/monitoring technologies including, as a minimum, FTIR and Jet-REMPI technologies. The ultimate intent is to gain an indication of the lowest concentrations that can be potentially measured. The combustion environment and associated complexities shall be considered in addition to fundamental aspects such as FTIR system path length, appropriate quantitation wavelength(s) and spectral/data resolution. Quantitative measurement performance shall include evaluation by dynamic spiking. Emphasis is to be placed on the HAPs considered to be target analytes from combustion sources (e.g., formaldehyde, acrolein, benzene and benzene-like, and the halogenated species). (Target Completion – 5/31/14)

TASK 6. Draft Performance Specification and Reference Method Measurement Methods

The contractor shall prepare draft versions of theoretical N_2O monitoring and reference method procedures. The contractor shall use 40 CFR Part 60 Performance Specification 2 and Reference

Method 7E as templates. The EPA WAM will provide the electronic versions of these methods to the contractor. The EPA WAM will be responsible for finalizing these documents. (Target Completion – 8/31/14)

TASK 7. Evaluation of HCl and Hg Compressed Gases and Ability to Achieve NIST-Traceability

The contractor shall evaluate elemental Hg compressed gas standards to determine if they can meet EPA requirements for NIST traceability to the extent that they can be used for regulatory purposes. (Target Completion – 6/30/14)

TASK 8. Experiments to Resolve the Elemental vs. Oxidized Hg Discrepancy

The contractor shall conduct experiments to further characterize the fundamental differences between NIST traceable solution $HgCl_2$ generators and Hg0 generators. Ideally, these experiments will indicate which gas standard is accurate and which is not. Should this be the case, the contractor shall propose experiments to determine the reason for the discrepancy. (Target Completion – 7/31/14)

TASK 9. Bromine Addition Hg Measurement Quality Testing

The contractor shall develop and evaluate approaches suitable for assessing measurement quality of APTB's Hg CEMs associated with pilot-plant testing operations in a simulated stack bromine environment. EPA Method 26A shall be evaluated to determine its ability to speciate between the bromine forms of HBr and Br_2. (Target Completion) 8/31/14)

TASK 10. Multi-Pollutant Combustion Research Facility – Repair and Operational Support

The majority of the pilot-scale research identified above will take place using APPCD/APTB's Multi-Pollutant Combustion Research Facility (MPCRF). This WA will support the repair, maintenance, and operations of this research facility. This WA will also procure and provide fuel (primarily coal) and fuel storage for daily operations and testing. In addition, this WA will support the repair, maintenance, and operations of this research facility by procuring necessary repair parts (e.g., tubing, fittings, thermocouples, gauges, etc) as well as expendable materials (e.g., filters, reagents, gases, etc)

TASK 11. Draft and Final Reports

Several data reports are required as a function of this WA. Known reports include, but are not limited to: Draft Data - Test data summaries for each location, brief summaries of associated testing activities and procedures, copies of all ancillary data forms and log sheets (with 60 days of

completion of testing); Final Data Report – All raw and summarized measurements data, QA/QC report of data quality and data limitations, if any.
Specifically, data from all tests will be reported in electronic files. They will be assembled in individual Excel notebooks that are unique for each test. Each Excel notebook will consist of:

- Summary page to summarize relevant information from the test
- Narrative page that will give a description of the test, analytical method, deviations from operating procedures during the analysis, deviations from specifications in the test plan or QAPP, problems encountered during the test or analysis, questions or issues concerning individual data points, special actions taken to verify data, data that should be further evaluated by the reviewer, and questions and issues to be addressed in preparation of the final data summary and report
- Data pages which contain all of the raw data as compiled by the individual instruments for field samples, lab samples, and QC samples
- QA/QC pages in which all pertinent QA/QC data are presented

(Target Completion – to be determined by WAM).

QA/QC Requirements

Multiple QAPPs will be required for this WA. The QAPPs shall be developed according to the requirements in Attachment #1 to this Statement of Work. Work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff.

Reports of Work:

The contractor shall prepare a work plan and budget as described in Task 1 within 20 days of WA effective date. The contractor shall prepare and submit monthly reports in accordance with the terms and conditions of the contract.

Health and Safety Protocols shall be prepared and submitted for approval as required by contractor, APPCD, and SHEM safety personnel.

The contractor shall maintain at least weekly communications with the WAM. Additionally the contractor shall inform the PO and the WAM in writing when 75% of the total funds and/or hours contained in the work plan are expended.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT & METHOD DEVELOPMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X Category III or IV QAPP: prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X QAPP Requirements for Measurement Projects

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

X QAPP Requirements for Method Development Projects

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of

samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.

3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.

3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.

4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.

4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.

4.5 Describe the method for uniquely numbering each sample.

4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Provide a description of the situation that requires the generation of a new or modified method.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.
3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.
3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).
4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.
4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:
- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis
- describe procedures for packing and shipping samples, and provisions for maintaining chain-of-custody, as applicable

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report, etc.). If a method/SOP will be developed, specify the required format.

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-06

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	
	Base X Option Period Number	

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	

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Period of Performance: From 04/01/2014 To 09/30/2014

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Work Assignment Manager Name: Ken Krebs (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2850 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 4-3-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Version 1.0
02/11/14

FY14 Scope of Work

WA 5-06

WA Title: Impact of Green Building Products and Risk Management Solutions on Indoor Air Quality

1. Purpose

The overall objective of this project is to develop, demonstrate, and evaluate sustainable practices for indoor environments. Sustainable practices are decisions and actions that consider, minimize, and harmonize the impact of materials and energy use on human health and the environment. Through integrated multidisciplinary and focused research, Indoor Environments Management Branch (IEMB) develops knowledge and tools that enable evaluation of sustainable practices for indoor environments. IEMB develops tools to characterize sources of indoor contaminants and investigates the relationships between sources of contaminants, the built environment and potential exposure to individual compounds and complex mixtures while considering the impacts of risk management solutions on building energy use. For example, IEMB investigates the impact of green building products on indoor air quality and develops risk management solutions where green building practices or products may potentially improve or impair indoor quality. Specific tasks are itemized in the section titled "Task Descriptions."

2. Background

Rapidly increasing energy costs coupled with increasing market acceptance of "green" or sustainable residential building design has resulted in an increased demand for sustainable building practices and "green" building products. However, sustainable "green" building practices (e.g., super insulated, tight buildings constructed with recycled or "natural" products) may inadvertently result in degraded indoor environmental quality or other downstream environmental challenges. As a component of "cradle to cradle" stewardship of materials and energy, there is a need to understand the impacts on the indoor environment of: (1) emissions, sorption and re-emission of organic and inorganic compounds from "green" building materials; (2) transport within the built environment; and (3) efficacy of control technologies such as air and surface cleaning, and their affect on building energy use.

Key pollutants of concern include endocrine disrupting compounds such as brominated flame retardants, phthalates, and perfluorinated compounds associated with consumer products, neurotoxins such as elemental mercury released from the debris field of broken compact fluorescent light bulbs, and air toxics such as formaldehyde released and sorbed by some indoor materials and surfaces. Formaldehyde is one key toxic pollutant in the National Risk Management Research Laboratory (NRMRL) Indoor Air Strategic Plan. It is among the US Environmental Protection Agency (EPA) listed urban air hazardous air pollutants (HAPs) and one of the predominant VOCs emitted from building products.

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT & METHOD DEVELOPMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

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(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

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□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

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□ QAPP Requirements for Secondary Data Projects

□ QAPP Requirements for Research Model Development and/or Application Projects

□ QAPP Requirements for Software Development Projects

X QAPP Requirements for Method Development Projects

□ QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects

ADDITIONAL QA RESOURCES:

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

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Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

NRMRL QAPP REQUIREMENTS FOR METHOD DEVELOPMENT PROJECTS

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2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Identify the specific analyte(s) of interest and the matrix/matrices under study.
3.2 Identify the analytical approach that will be used and how it will be optimized for this study. Also describe any tests of interference and analyte stability.
3.2 Identify the method performance metrics (QA/QC checks) that will be used to evaluate the method, including the procedures used. These metrics could include (but are not limited to) positive and negative controls, sensitivity, precision, accuracy, recovery, linearity, specificity, robustness, and range.

4. SAMPLING PROCEDURES

4.1 Provide the requirements for samples that will be used to test the method (including matrix and presence/concentration of analytes).
4.2 If synthetic (i.e., laboratory-prepared) samples are used, describe the preparation of these samples.
4.3 If non-synthetic (i.e., real-world sample) samples are used, address the following:
- describe the sampling design that will be used and the steps taken to assure that representative samples are collected
- discuss or reference each sampling procedure
- provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis
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4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.

5. MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each preparation or analytical procedure to be used, if known. Include steps for preparation, calibration, measurement, quality control, and reporting.

5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. METHOD PERFORMANCE METRICS

For each method performance metric (QA/QC check) identified in Section 3.2, specify the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

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7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
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9. REFERENCES

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Primary emissions from materials and products as well as sorption and re-emission from surfaces are key factors that govern indoor concentrations.

There are three components of IEMB's research approach: (1) Develop source models that simulate emissions from green building products, (2) develop sorption/re-emission models for green building products, and (3) determine the reliability of source/sink models in full-scale indoor environments. The source emissions model parameters obtained from EPA's chamber tests will be applied to IAQ models to determine the impact of the use of "green" building design products on indoor concentrations of organic and inorganic contaminants. Source and sink models and control strategies will be evaluated by studies conducted in APPCD's Research Test House (RTH), operated by the contractor. Specific tasks and the schedule for tasks to be conducted in the RTH shall be described in amendments to this work assignment or described in other task-specific work assignments.

3. Task Descriptions

The contractor shall conduct the following tasks:

The contractor shall maintain the research test house in ready mode for model evaluation or other studies as described in amendments to this work assignment or described in separate work assignments that utilize the research test house. Specifically, the contractor shall ensure that:

All miscellaneous and standard operating procedures (MOPs and SOPs) are accurate and up to date for contractor operated measurement or control systems. At a minimum, the contractor shall ensure that:

- The data acquisition system is functional
- At least two temperature sensors and two RH sensors are functional
- The B&K Multi-gas Analyzer is calibrated for SF6
- The SF6 dosing and sampling system is functional

Per Contract number EP-C-09-027, the contractor shall maintain the instrumentation in the RTH to ensure that the RTH can be utilized for specific research tasks within 30 days of notification through written amendments to this or other work assignments.

4. Reports

The contractor shall provide the EPA work assignment manager monthly progress reports as specified in the contract.

5. Schedule of Tasks, Reports, and Deliverables

The contractor shall provide monthly reports of the RTH operational status. Reports and deliverables for other tasks, including new or revised MOPs or SOPs that are required to support QAPPs developed for specific research tasks to be conducted at the RTH, will be described in amendments to this work assignment.

6. QA/QC

The contractor shall provide input to QA test plans, addendums, technical reports, and manuscripts developed by EPA staff for and from specific experiments to be conducted in the research test house. Data gathering/manipulation shall not begin until the QAPP has been approved by the EPA QA manager. The QA plan shall be developed according to the requirements in Attachment #1 to the Statement of Work. Environmental data collection cannot start until both APPCD and ARCADIS QA staff have received the completed signature page for the QAPP. Specific experiments, schedules and deliverables will be described in amendments to this work assignment.

All draft or revised QAPPs to be implemented by ARCADIS that are submitted for APPCD QA approval must be accompanied by a signature page that is signed by the ARCADIS work assignment leader and ARCADIS QA officer to show that they have reviewed and approved the QAPP. Upon final approval of the QAPP, the APPCD work assignment manager and QA manager shall add their signatures to the signature page to show their review and approval.

7. Suggested Skills

This project will require contractor staff with the following skills: modification and adaptation of scientific apparatus to meet project objectives, sample collection and extraction, data processing and analysis, preparation, operation and maintenance of the RTH.

8. Special Requirements

The contractor shall provide necessary health and safety procedures, documentation, and training to contractor staff to ensure safe conduct of the experiments at contractor controlled facilities.

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EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-07

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Characterizing cross-media tra
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Susan Thorneloe	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-2709
	FAX Number:
Project Officer Name: Kevin Sudderth	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-3670
	FAX Number:
Other Agency Official Name	Branch/Mail Code:
(Signature) (Date)	Phone Number:
	FAX Number:
Contracting Official Name: William Yates	Branch/Mail Code:
(Signature) (Date)	Phone Number: 513-487-2055
	FAX Number:

STATEMENT OF WORK WA 5-07

I. **TITLE: Characterizing cross-media transfers from landfills, and management of coal ash and other industrial by-products**

II. **Background and Purpose**:

This work assignment will build on previous research to improve the understanding of cross media transfers related to management of landfills, coal ash, and other industrial by-products. This research supports program office needs to provide the technical basis for evaluating emissions to the environment that can cross air, water, and land.

The major focus of this work assignment is on the use of the Leaching Environmental Assessment Framework (LEAF) to evaluate how air pollutants in fly ash and other air pollution control residues may re-enter the environment based on how the material is managed through disposal or use in engineering and commercial applications. LEAF is also suitable for use on a broad range of industrial by-products and therefore OSWER is developing a guidance document on the use of LEAF relying on outputs from this research. In addition, the coal combustion residues final rule is to be issued later this year. This work assignment will help support the regulatory effort through range of quick turn-around assignments include providing responses to comments received from EPA's Notice of Data Availability (NODA). Support is also to be provided on the risk assessment final documentation in how LEAF was used to develop source term calculations for ash monofills. Finally, for LEAF implementation, source term calculations are to be developed working with OSWER in their development of guidance which will prioritize the applications where LEAF would be used and source term calculations to be developed. In addition, work is planned for completing LeachXS-Lite to convert it from a research version to a more user friendly versus for LEAF implementation to support program office driven work.

The funding for the landfill research is from a CRADA with Covanta Energy. The focus of this work is to reduce current uncertainties to estimate landfill gas emissions by quantifying all biodegradable components in municipal solid waste from sorting waste from several different municipalities.

Provided below is a list of tasks for FY2014 for the research to be conducted through this work assignment.

III. Scope of Work

1. **Development/Modification/Compliance with QAPP**: The contractor shall develop quality assurance documentation as required in Appendix #1 to this Statement of Work. Any work involving environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on the "Quality Assurance Review Form" included with this extramural activity.

There is an existing QAPP for this research (Q-TRAK # 03069-A00244) which will be updated as necessary to conduct this work. The QAPP was approved on November 17, 2011. Updates as needed will be conducted. There is also an approved QAPP for the CRADA funded project (Q-TRAK# 13029/A 19326). This QAPP was approved on Dec 9, 2013 and we do not anticipate a need to update it unless there is a change in the scope of work.

2. **Report to illustrate how LEAF test methods are used to calculate source terms for use in fate and transport models.** The Contractor shall:

   (a) Define scenarios to be modeled with the WA-COR to obtaining input from program office;

   (b) Fill any data gaps for mass transfer coefficients;

   (c) Repeat testing of leaching as function of pH and liquid-solid testing where there are unresolved questions about the influence of air pollution control technology on COPCs leaching; and

   (d) Document how leach results are used to improve future environmental management decisions on the use of coal ash in un-encapsulated applications including sample calculations and examples to help the reader understand how this information is used in environmental decision making.

   (e) Develop an EPA report using formatting requirements for this contract providing sample calculations and other information helpful to potential users of the LEAF test methods.

   (f) Revise the report with comments provided by EPA from the review process including peer, quality assurance and control, and administrative review.

3. **Comparison of field and LEAF leachate data.** A draft final report was submitted into administrative review on February 20, 2013. Minimal effort to address administrative comments is expected due to the number of reviews that have been already conducted on this report. This is a major output for OSWER and is a program office driven report.

4. **Completion of Leach-XS Lite.** The Contractor shall make improvements to the user interface based on comments from the EPAWA-COR including update of input templates, integration of embedded tutorials, and addition of screening assessment scenarios as embedded assessments to develop an improved source term for use in OSWER's Industrial Waste Management Evaluation Model (IWEM) [http://www.epa.gov/osw/nonhaz/industrial/tools/iwem/] or other ground water transport and fate model. The Contractor shall make changes to IWEM as needed based on EPA review of the software meeting the requirements for EPA software products.

5. The Contractor shall prepare briefing materials as needed for preparation for an SAB meeting to be scheduled in 2014.

6. The Contractor shall complete work to meet the goals of a Cooperative Research and Development Agreement to reduce current uncertainties on factors used to estimate carbon emissions from landfills. This includes improving component specific gas potential values, quantity of non-fossil carbon that may not be degraded over a 100-year time horizon, and accounting for differences between carbon collected versus carbon released through leaks in a landfill. The Contractor shall document this research through series of peer-reviewed journal articles to develop inputs to be used in the municipal solid waste decision support tool and EPA's AP-42 for landfill gas emission inventories.

IV. Schedule of Deliverables

Task 1 - Status of any updates to QAPPs within one month of WA approval

Task 2 – TBD based on priorities specified by OSWER

Task 3 – ongoing as needed based on comments from administrative review

Task 4 - Completion by end of performance period

Task 5 - Briefing materials for meeting with EPA's Science Advisory Board (SAB) – date to be determined based on when mtg with SAB is scheduled

Task 6 - Schedule to be determined based on CRADA priorities and funding

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.

4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-10

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Enhancing the Field Use of he

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Worth Calfee (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates (Signature) 3-25-14 (Date)		Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

STATEMENT OF WORK

ENHANCING THE FIELD USE OF THE 37-MM FILTER CASSETTE VACUUM SAMPLING DEVICE

TABLE OF CONTENTS

I. TITLE

Enhancing the Field Use of the 37-mm Filter Cassette Vacuum Sampling Device

II. PERIOD OF PERFORMANCE

The period of performance for this Work Assignment (WA) is from the date of Award to September 30, 2014.

III. SUMMARY OF OBJECTIVES

The proposed work will evaluate options for enhancing the "ease of field use" of the 37mm Cassette type Vacuum Sampling device. The ultimate object is to generate data that can be used to select appropriate sampling devices following a bioterror event. Scientifically-testing sampling methods will provide increased confidence in the ability to characterize contamination following such an event.

IV. RELEVANCE

The products will be used to guide decisions with regard to the selection and application of candidate vacuum-based sampling technologies and methods for characterization of contamination post bioterror incident. The results of this work will be made available through published reports, journal papers, and/or conference abstracts and presentations.

V. BACKGROUND

Methods for detection and characterization of biological agent on surfaces following a bioterror incident include swabs, wipes, and vacuum. The currently-used vacuum-based method utilizes woven collection socks attached to a cardboard nozzle. The sock and nozzle affix to the most upstream end of the vacuum hose, so that agent is captured by the sampling sock and does not contaminate the equipment. Multiple samples can be collected in progression by affixing a new collection sock to the vacuum hose between samples. Some have demonstrated that this method has utility in collection of biological agent (Brown et al., 2007); however most contend that improvements could be made to the method or another vacuum-based sampling device would be more efficient. Some criticisms of the current method are that the vacuum socks often come from the manufacturer with clearly visible holes in the sock seams, and that the filters are too cumbersome for laboratory handling and extraction during analysis. Preliminary data collected by the EPA suggest that none of the currently-available vacuum-based devices are optimal for field use and for laboratory analysis methods. The 37mm cassette device is slightly preferred over the vacuum sock and Trace Evidence Filter devices for reasons including Quality Control, collection efficiency, ease of shipment, sample integrity post-collection, price, and commercially availability. The major criticism of the 37mm device is its required long and tedious sample collection procedure, and relatively small area sampled per sample.

VI. SCOPE

Under this SOW, the contractor, under the direction of the Environmental Protection Agency (EPA) in collaboration with the Centers for Disease Control and Prevention (CDC), will perform a study to evaluate several options for enhancing the "ease of use"

and "collection efficiency" of the 37mm cassette-type vacuum-based sampling device, for collection of biological agent from environmental surfaces.

VII. TECHNICAL APPROACH

A known quantity of Bacillus spores will be deposited by aerial dispersion onto large coupons (1 $ft.^2$ or greater) containing carpet. The coupons will then be subjected to vacuum-based sampling according to protocols developed jointly by CDC and EPA. Recovery will be determined for each sampling method according to culture-based microbiological assays developed by CDC. All test parameters, such as test chamber size, coupon materials and sizes, sampling methods, methods of extraction / analysis will be determined by agreement among participating experts from EPA and CDC. The collective set of tests must be able to be completed within the allotted budget.

Table 1. Potential test parameters to vary during experiments

Parameter	Potential Variants
1. Material Surface Types	Carpet and two other material types
2. Coupons and Replicates	The number of replicates shall be determined by the amount of effort and funding available.
3. Nozzle	4 nozzle variations (Standard (control), widened, and bristle-enhanced nozzles are potentials)
4. Pump Type	The standard nozzle and one enhanced nozzle shall be evaluated with two sampling pump types (i.e., Vac-U-Go pump and a personal sampler pump)
5. Traverse Speed	The standard nozzle and one enhanced nozzle shall be evaluated at two collection speeds (traverse speed of sample nozzle across surface)
6. Sampled Area	Evaluate one or two devices over $1ft^2$ and larger sampled areas (up to $4ft^2$)
7. Spore Concentration on Surfaces	The standard nozzle and one enhanced nozzle shall be evaluated against at least two surface concentrations. (i.e., E6 – E7 ft^{-2}, and E2 – E3 ft^{-2})
8. Humidity Level	Two RH levels (30 – 90 %RH) for coupon conditioning after inoculation and before sampling (conditioning for ~48 hours)

VIII. FACILITIES AND MATERIALS

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr., unless approved otherwise by the EPA WAM. The sampling activities shall be conducted in the NHSRC's Decontamination Technologies Research Lab (DTRL) located in H-224, H-222, H-122a, and H-130a. The lab contains the necessary equipment for the tasks described herein. The analysis of the biological samples shall be conducted in the Microbiology lab, located in E-386, E-388, and E-390.

IX. TASKS

To achieve the desired objective of this effort, work for this SOW can be broken down into three tasks. These tasks are a continuation of the testing outlined in the QAPP developed during option 4 (Work Assignment 4-10)

Task 3. Test Experimentation – Vacuum Device Modifications and Evaluation

At least eight and a maximum of twelve sets of tests shall be conducted in which the 37mm cassette device is evaluated. Some potential modifications to collection procedures or device design include:

1) Increase nozzle width (yet maintain opening cross-sectional area) to increase the width of coverage by a sampling sweep
2) Enhanced nozzle design (enhancing the nozzle characteristics to enhance particle resuspension from surfaces)
3) Evaluate the device using sampling pumps optimized for field use (e.g. disposable pump, battery powered pump, personal sampling pump, etc)
4) Evaluate the collection efficiency (with or w/o modifications) at lower surface concentrations (i e., as low as repeatedly possible).
5) Evaluate a more rapid sweep speed, such that samples could be collected more rapidly using the 37mm device (i.e., 4 x 1ft sweeps per second)
6) Evaluate the efficiency when sampling several area sizes
7) Evaluate the efficiency as a function of spore concentration level
8) Evaluate the efficiency as a function of relative humidity

For these tests, experimentation shall be carried out in accordance with the QAPP. Deviations from the QAPP shall be documented in writing and justified.

Task 4. Report

Following completion of all data collection, a brief report shall be prepared documenting the details of the tests, including methods, quality control measures utilized, collected data, interpreted results, and conclusions. The report shall conform to the EPA style.

X. MILESTONES, DELIVERABLES, AND COMPLETION DATES

QAPP Amendment

A draft QAPP and Work Plan shall be provided within 30 days of the award of this agreement. This shall be provided prior to commencement of the tests described within this SOW. The combined QAPP and Work Plan shall include scope, scheduling, and costing information for each of the tests planned.

Reporting

A Draft Report shall be provided to EPA for review by August 15, 2014.

XI. RESPONSIBILITIES

This project is initiated by the USEPA Office of Research and Development, National Homeland Security Research Center (NHSRC), Decontamination and Consequence Management Division (DCMD) in Research Triangle Park, NC. This project is a collaborative effort with the US Centers for Disease Control and Prevention in Atlanta, GA. The U.S. EPA WACOR shall be Dr. M. Worth Calfee (phone 919-541-7600, email calfee.worth@epa.gov). Dr. Sang Don Lee shall be alternate WACOR.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Enhancing the field use of the 37-mm FILTER Cassette Vacuum Sampling dEVICE
Description:	lab tests to evaluate various vacuum sampling devices
Project ID:	HS5.02.02
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	III
Security Classification:	Unclassified
Project Type:	Sampling and Analysis
QAPP Status 1:	Pending Revisions
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027 Work Assignment Number: 5-10 Delivery/Task Order Number: n/a Modification Number: n/a Other: n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

enhancing the field use of the 37-mm FILTER Cassette
Vacuum Sampling dEVICE

Does the QAPP require *any* revision by the contractor**

maybe eventually, but not initially. Revisions will be submitted to NHSRC QA

No — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles. ?*

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html)*

After Award Documentation

Other	Documentation of an organization's Quality System. QMP developed in accordance with:
	Explain: NHSRC QMP
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: NHSRC QMP - QAPP developed in accordance with Attachment # 1
	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Ramona Sherman 02/07/2014

Worth Calfee NHSRC-DCMD Technical Lead Person	02/06/2014 Date	Ramona Sherman NHSRC-IO QA Staff Member	02/06/2014 Date

QAPP REQUIREMENTS FOR SAMPLING AND ANALYSIS PROJECTS

(from Appendix B of the NHSRC QMP)

A sampling and analysis activity or project is typically defined as a study performed to generate data to either monitor parameters on a routine basis or to characterize a particular population for later studies. The following requirements should be addressed as applicable.

SECTION 1.0, PROJECT DESCRIPTION AND ORGANIZATION

1.1 The purpose of the study shall be clearly stated in the sampling and analysis plan (SAP).

1.2 Responsibilities and points of contact for each organization shall be identified in the SAP. This should include identification of key personnel and/or organization(s) responsible for sample collection and custody, analytical and/or process measurements, data reduction, report preparation, and quality assurance.

SECTION 2.0, SAMPLING

2.1 Sampling points for all measurements (*i.e.*, analytical, physical, and process, including locations and access points) shall be identified in the SAP whenever possible. If the specific locations cannot be identified at the time of plan generation, discuss the documentation and/or communication mechanism(s) for ensuring adequate information is captured to later identify sampling points.

2.2 The anticipated sampling frequency (*e.g.*, how many sampling events and how often events occur) and number of sample types (*e.g.*, metals, VOCs, SVOCs, *etc.*) taken at each event shall be provided.

2.3 The expected measurements (*i.e.*, specific analytes) planned for each sample type shall be summarized.

2.4 If applicable, known site_specific factors that may affect sampling procedures shall be described.

2.5 If applicable, any site preparation (*e.g.*, sampling device installation, sampling port modifications) needed prior to sampling shall be described.

2.6 Each sampling procedure to be used shall be discussed or referenced.

2.7 If compositing or splitting of samples is planned, the applicable procedures shall be described.

2.8 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

2.9 Containers used for sample collection, transport, and storage for each sample type shall be described.

2.10 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*) shall be described.

2.11 Requirements for shipping samples shall be described.

2.12 Holding times requirements shall be noted.

2.13 Procedures for tracking samples in the laboratory and for maintaining chain_of_custody when samples are shipped shall be described. COC procedures shall be described to ensure that sample integrity is maintained (labeling, seals, records).

2.14 Information to be recorded and maintained by field personnel shall be discussed.

SECTION 3.0, TESTING AND MEASUREMENT PROTOCOLS

3.1 Each analytical method to be used shall be referenced. This includes EPA-approved and other validated nonstandard methods.

3.2 If applicable, modifications to EPA_approved or other validated nonstandard methods shall also be described.

SECTION 4.0, QA/QC CHECKS

4.1 The SAP shall list and define all QC checks and/or procedures used for the project, both field and laboratory as needed.

4.2 For each specified QC check or procedure, required frequencies and acceptance criteria shall be included.

SECTION 5.0, DATA REDUCTION AND REPORTING

5.1 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

5.2 The reporting requirements (*e.g.*, units, reporting method [*e.g.*, wet or dry]) for each measurement and matrix shall be identified.

SECTION 6.0, REPORTING REQUIREMENTS

The deliverables expected from each organization responsible for field and/or analytical activities shall be described.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

Basic Research Project - pertains to a study performed to generate data used to evaluate unproven theories, processes, or

☐ technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality

assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-11

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Evaluation of Decontamination

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2):

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Lukas Oudejans (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2973	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3670	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates 3-25-14 (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

STATEMENT OF WORK
Contract EP-C-09-027

PROJECT NUMBER HS6.06.01 [FORMERLY C.2.3.3]

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

I. TITLE

Evaluation of Decontamination Technologies against Radionuclides under Various Environmental Conditions

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from time of award until September 30, 2014.

III. SUMMARY OF OBJECTIVES

This work will wrap up the evaluation of the impact that environmental conditions may have on the ability of strippable coatings and/or decontamination gels to properly cure on a representative building material in the urban environment. This work was initiated under previous WA 4-11 but was not completed in part to technical difficulties maintaining an environmental chamber at specific temperature and relative humidity conditions as well as the US Government shutdown of October 2013. This WA will complete this work by completion of Task 4. This work assignment (WA) will not assess the impact that these environmental conditions may have on the technology's decontamination efficacy (removal of radionuclides from a surface).

IV. TASKS

The contractor shall perform the following tasks as part of this work assignment. Completed tasks under previous WA are noted as completed

TASK 1. DEVELOPMENT OF QUALITY ASSURANCE PROJECT PLAN (QAPP)

Not applicable; an approved QAPP is in place

TASK 2. SETUP GLOVE BOX TEMPERATURE (T) AND RH CONTROL

The contractor shall continue to use the modified glove box in which temperature, relative humidity (RH) and air exchange can be controlled between 0 and 40 deg C and RH between 20 and 80% in combination with airflows of 1 air exchanges per hour or no airflow.

TASK 3. COUPON MANUFACTURING

The contractor has completed this task.

TASK 4. TEST MATRIX

The contractor has completed as testing related to an air flow of one air exchange per hour. The contractor shall complete this test matrix by measurements described below under a stagnant, no airflow condition following application of the strippable coating or gel.

The contractor shall measure the time to cure the previously used strippable coating/gel on SS and concrete coupons under twelve environmental conditions consisting of three temperatures (selected within the 0-40 °C range), two RH values (20-80% range) and no air flow.

Each test point shall consist of three concrete coupons (two vertical, one horizontal) and one SS coupon. In addition, the curing time shall also be measured for one set of coupons for each decontamination technology that has been pre-wetted and kept at a specific room temperature, high humidity condition. This yields 4 additional test points. Hence the total test matrix will consist of 28 measurements of the curing time.

The coating/gel shall continue to be applied per manufacturer's instructions outside the modified glove box using a separate enclosure to satisfy health and safety concerns related to the application of the coating/gel.

The contractor shall continue to document findings in EPA approved laboratory notebooks as well as by digital photographs which shall depict the coating/gel on the coupon surface following (un)successful attempts to peel away this coating/gel.

TASK 5. TEST REPORT

The contractor shall prepare a test report (a draft version for EPA WAM review and approval followed by a revised draft for peer and QA review; and a final version) which shall include the test conditions, methods, quality assurance, and results of the tests conducted per the requirements of this SOW. The report shall also include a brief description of the decontamination technologies tested. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPN 800/K-95/002). Substantive portions of this

handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

V. DELIVERABLE SCHEDULE

On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, cumulative financial expenditures and cost and schedule variance.

The deliverables required are shown in Table 1.

Table 1: Deliverable Schedule.

Task Number	Deliverable	Due Date
	Biweekly research meetings	N/A
1	Draft QAPP Final QAPP	N/A; completed under WA 4-11
2	Modified glove box with T, RH and airflow	N/A; in use
3	Coupons to conduct test matrix	Completed
4	Curing time of 4 decon coatings/gels at all test conditions; associated digital photographs	9/30/2014
5	Draft report to WAM Revised draft report for QA and peer review Final report	8/15/14 9/2/14 9/23/14

VI. REPORTING REQUIREMENTS

- Data related to this project shall be stored on the US EPA server's DTRL shared drive;
- Transfer of project data shall occur at the conclusion of each experiment within the task. Detailed written summaries of experimental procedures and results shall be provided to the WAM within one week from completion of data analysis;
- Reporting results of Task 4 shall be in the form of spreadsheet(s) using MS Excel 2007 which will be reviewed by the EPA WAM and used for data reporting;
- All photographs and videos shall be properly documented by providing information on the test conditions under which they were taken.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM

Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Evaluation of Decontamination Technologies against Radionuclides under Various Environmental Conditions	
Description:	This work will evaluate the impact that environmental conditions may have on the ability to cure strippable coatings and/or decontamination gels to a representative building material in the urban environment. Curing of these coatings and/or gels is critical in obtaining a high removal efficiency of targeted radionuclides and assures the easy removal of such coating/gel from a surface.	
Project ID:	HS6.06.01 -- C.2.3.3	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	III	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Existing QAPP	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-09-027
	Work Assignment Number:	5-11
	Delivery/Task Order Number:	N/A
	Modification Number:	N/A
	Other:	N/A

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?

(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

65_2013_QAPP.DCMD, 10/24/13;Evaluation of Decontamination Technologies against Radionuclides under Various Environmental Conditions

Does the QAPP require *any* revision by the contractor**

Amendments to QAPP will be generated by the contractor, if needed

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles. ?*

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Not Applicable	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Lukas Oudejans NHSRC-DCMD Technical Lead Person	02/28/2014 Date	Ramona Sherman NHSRC-IO QA Staff Member	02/28/2014 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a

critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

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These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
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These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the

"Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-12

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Interaction of Fumigation with

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Lukas Oudejans (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-2973 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates (Signature) 5-20-14 (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

STATEMENT OF WORK
Contract EP-C-09-027

PROJECT NUMBER C.2.3.2

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

I. TITLE

Interaction of Fumigation with Realistic Surfaces from Subway System – Material Demand Study

II. PERIOD OF PERFORMANCE

The period of performance for the tasks detailed in this Statement of Work (SOW) shall be from time of award until September 30, 2014.

III. SUMMARY OF OBJECTIVES

Previous WA 4-12 evaluated the impact that dirt and grime, as present on unpainted subway concrete, may have on fumigation conditions. The WA considered whether these realistic surfaces impact the procedures for sampling of Bacillus anthracis (surrogate) spores and determined the impact the dirt and grime have on the efficiency of two efficacious fumigation technologies against B. anthracis (surrogate) spores. As part of Amendment I to the WA 4-12, the material demand of these concrete surfaces was determined on the operational fumigation conditions to reach remediation goals. The objective of this WA renewal is to summarize the kinetics data into a test report which was not completed at the end of the previous WA. This report will be merged with the existing report describing the fumigation tests to create one final report.

IV. BACKGROUND

In the event of a chemical/biological incident in a transportation hub like a subway system, remediation may require the use of volumetric decontamination approaches such as fumigation as an effective decontamination method. Previous (NHSRC) studies have shown that fumigants like chlorine dioxide and hydrogen peroxide vapors can be highly efficacious if applied under the specific environmental (temperature and relative humidity) conditions. It is, however, unclear what the impact is on the efficacy of dirt and grime on these realistic building materials. Such presence may result in change in sporicidal activity of the fumigant and may require changes in operational fumigation conditions ("material demand") to reach remediation goals.

V. TASK

The contractor shall perform the following task as part of this work assignment. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall use the approved two QAPPs as finalized under previous WA 4-12.

TASK 1. TEST REPORT

The contractor shall prepare a test report (a draft version for EPA WAM review and approval followed by a revised draft for peer and QA review; and a final version) related to the fumigation and material demand studies as conducted under the previous WA 4-12. This report shall include the test conditions, methods, quality assurance, and results of the tests conducted per the requirements of this SOW. The report shall also include a brief description of the decontamination technologies tested.

VI. DELIVERABLE SCHEDULE

On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, cumulative financial expenditures and cost and schedule variance.

The deliverables in the form of completed data sheets are shown in Table 1.

Table 1: Deliverable Schedule.

Task Number	Deliverable	Due Date
1	First draft test report to EPA WAM	6/2//2014
	Revised draft to EPA WAM for peer and QA review	6/6//2014
	Final test report	6/27/2014

VII. REPORTING REQUIREMENTS

- Reporting sheets using MS Excel 2007 shall be developed by the contractor, reviewed by the EPA WAM and used for intermediate data reporting;
- The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPN 800/K-95/002). Substantive

portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM

Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Interaction of Fumigation with Realistic Surfaces from Subway System	
Description:	This work will evaluate the impact dirt and grime, as present on unpainted subway concrete, have on fumigation conditions, consider whether these realistic surfaces will impact the procedures for sampling of Bacillus anthracis (surrogate) spores and determine the impact the dirt and grime have on the efficiency of two efficacious fumigation technologies against B. anthracis (surrogate) spores.	
Project ID:	C.2.3.2	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	III	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Final	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-09-027
	Work Assignment Number:	5-12
	Delivery/Task Order Number:	N/A
	Modification Number:	N/A
	Other:	N/A

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?

(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:

53_2013_QAPP.DCMD (07/16/2013) and 21_2014_QAPP.DCMD (2/20/2014)

Does the QAPP require any revision by the contractor**

No

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles. ?*

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with: Explain: NHSRC QMP and Attachment 2 to SOW Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Lukas Oudejans NHSRC-DCMD Technical Lead Person	05/01/2014 Date	Ramona Sherman NHSRC-IO QA Staff Member	05/01/2014 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified, meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

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Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the

"Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-13

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Biocontainment Lab Technical S

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Worth Calfee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Biocontaminant Laboratory Technical Support
Statement of Work

Project# HS6.02.01
(OMIS DCMD 4.12)
(APPCD ON-SITE CONTRACT EP-C-09-027, WA 5-13)

TABLE OF CONTENTS

I. TITLE: Biocontaminant Laboratory Technical Support

II. PERIOD OF PERFORMANCE

The period of performance for this work assignment shall be from the April 1, 2014 – September 30, 2014.

III. SUMMARY OF OBJECTIVES

The proposed work will provide microbiological support to on-going and planned research efforts conducted by EPA's National Homeland Security Research Center (NHSRC). Such support includes, but is not limited to, growth and maintenance of biological cultures and stocks; preparation of media and reagents used in microbiological analyses; organization, inventory, and upkeep of laboratory notebooks, glassware, equipment, and supplies; preparation of suspensions of various surrogate biological agents; sterilization of test materials and instruments; inoculation of coupons and materials used in decontamination studies; creation of new and update of existing MOPs used in decontamination research; and numerous laboratory analyses used to determine survivorship of biological agents in decontamination, disposal, and containment studies.

IV. RELEVANCE

The results of the work conducted under this WA study will be used to support other research projects related to the selection and application of candidate decontamination technologies for buildings or areas (i.e., indoor or outdoor scenarios) contaminated with biological warfare agents. Data generated through this work will also support containment and disposal-related homeland security research. The results of these works will be made available through published reports, journal papers, and conference abstracts and presentations.

V. BACKGROUND

Following a bioterrorist attack, materials contaminated with biological agent pose significant health threats. The EPA's NHSRC conducts research to develop methods and technologies able to rapidly and cost-effectively remediate areas affected by a bioterrorism attack. Tasks performed under this work assignment support such research.

VI. SCOPE

The objective of this work is to provide high-quality microbiological support to homeland security-related decontamination, disposal, and containment research projects. Most (but not all) of these projects being supported will be conducted via WAs under this contract as well. Such projects often require material coupons spiked with surrogate organisms as well as survivability analyses of coupons following treatment. For these tasks, laboratory technicians trained in aseptic techniques and general microbiological laboratory procedures shall carry out biological analyses on samples generated during decontamination, disposal, and containment research. Data generated and collected during these analyses shall be properly recorded and shared in a timely manner. In

addition, a significant amount of laboratory management is needed to sustain an efficient workflow.

VII. TECHNICAL APPROACH

Microbiological efforts will generally include the following activities: (1) preparation (e.g., sterilization) and analysis of coupons using various types of materials and biologicals (2) analysis of decontamination and containment research samples (3) developing standard diagnostic protocols for several decontamination technologies to assess microbial survivability (4) preparation of microbiological media and reagents (5) and timely reporting of data . Note: The treatment studies themselves (e.g., fumigation at specified conditions, rotary kiln operation, deposition studies, etc) will be conducted via the use of other WAs performed under this contract. The general purpose of this WA is to provide microbiological support for those other WAs. Additionally, projects may be initiated by the WAM in order to fully utilize personnel during periods of low workload.

The specific microbiological laboratory efforts will include (but not limited to) such things as the following:

(1) Spiking of coupons with the appropriate controls for any NHSRC decontamination, disposal, and/or containment projects.
(2) Growth and maintenance of the bacterial (and viral) cultures used for the standard diagnostic protocols
(3) Perform the survivability analyses as required by the projects mentioned above.
(4) Develop standard diagnostic protocols if necessary to assess microbial survivability
(5) Prepare, sterilize, dispense, and confirm sterility of microbiological media.
(6) Properly destroy and dispose of contaminated/spiked testing materials
(7) Maintain laboratory notebooks, supplies, reagents, microbiological media, equipment, and certificates.
(8) Operation and maintenance of in–house microbiological instruments and equipment.
(9) Evaluate data acquired and prepare reports documenting the results obtained, and the quality of the results. The reports shall include any tables, charts, graphs, drawings, or appendices necessary to fully explain the experiments performed, shall clearly document the results, and shall support the quality of data included.
(10) Provide the raw data to the WAM of this WA, and as well to the WAM of the project being supported. Data shall be provided electronically in a timely manner (as soon as available, not greater than 2 days following completion of the analysis generating said data) when requested or as indicated by a QAPP. All data sheets shall be legible, and contain all pertinent identifier information (i.e., technician name, date, number of WA being supported, analyses performed, organism, etc.)
(11) The contractor shall comply with all requirements as delineated on the QA requirement as defined in Attachment #1 to the SOW.

VIII. FACILITIES AND MATERIALS

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr. The Biocontaminant Laboratory located in E390 is a BSL-2 facility equipped with biological safety cabinets, microbial dynamic and static growth test chambers and bioaerosols test chambers as well as standard microbiological equipment such as steam autoclaves; incubators; refrigerators; centrifuges; light, fluorescent, and phase contrast microscopes, colony counters; and analytical balances.

IX. TASKS

To achieve the desired objective of this effort, the Microbiological work for this SOW can be broken down into five tasks.

Task 1. Coupon preparation and inoculation

The materials and size of the coupons shall be specified by the WAM based upon the inoculation and analytical procedures to be used, which will be specified in the QAPP for each WA the microbiology lab is supporting. There shall be at least three classes of coupons for each of the DCMD projects mentioned above: (1) positive controls, (2) negative controls, and (3) test coupons. The positive controls and test coupons shall be spiked with the appropriate biological surrogate (spores, vegetative bacteria, or virus). The negative controls shall undergo the coupon preparation (e.g., sterilization), but shall not be spiked with any target. The spiking procedure shall be appropriately documented in the QAPP. Method demonstration shall be performed and deemed acceptable to the WAM of this WA in conjunction with the WAM of the project the microbiology lab is supporting, prior to the inoculation of the coupons. The basis for acceptability shall be the acceptance criteria set-forth in the QAPP. All positive control, negative control, and test coupons shall be transferred from and to the Biocontaminant lab according to the delivery schedule to be discussed for each project. All transfers shall be accompanied by chain-of-custody (COC) form.

The described procedures are for planning purposes only and may be changed by the WAM, in consultation with the contractor, within the level of effort anticipated for the SOW as currently written.

Task 2. Agent Survivability analyses.

Agent growth on coupons will be evaluated qualitatively and quantitatively as specified in the standard operating procedures (MOPs 6516, 6526, 6527, 6528, 6529, 6535a, and MOP 6555 -6566) of the Biocontaminant Laboratory Facility manual, or as specified in a QAPP. Under the guidance of the WAM, the contractor shall develop standard diagnostic protocols if necessary to assess survivability.

Task 3. Ancillary Research Projects

Additional projects may be designed and requested by the WAM to fully utilize the contractor personnel during periods of reduced workload. Such projects may include, but are not limited to: laboratory organization and cleaning, limit of detection studies,

sampling efficiency studies, decontaminant technology application and efficacy studies, microbial characterization studies, bacterial spore purification studies, sampling and analysis methods development studies, and studies involving aerosol deposition of spores onto material surfaces. This task may require the contractor to briefly work in Highbay labs or other labs within the EPA-RTP facility.

Task 4. Laboratory Management
The efficiency of the Biocontaminant Laboratory workflow requires effective laboratory management. Therefore, the contractor shall maintain laboratory notebooks of all activities; keep all utilized equipment up-to-date with regards to certification and routine maintenance; maintain inventories of frequently utilized chemicals, reagents, and media as to prevent delays in experimentation due to insufficient supplies; carefully plan all work as to maximize the use of staff; maintain and update MOPs and MSDS repository; perform periodic disinfection of laboratory surfaces and biological safety cabinets; maintain temperature records for laboratory incubators, refrigerators, and freezers; and promptly inform the WAM of any issues associated with laboratory work, workload, equipment failures, or supply needs.

Task 5. Agent Recovery and Inoculum Preparations for Aerosol Testing Research
This task will involve providing microbiological support to on-going and new research initiatives involving aerosol testing. The Aerosol Test Facility (ATF) group will be utilizing agent preps, inoculated coupons, etc. prepared under this task. Also under this task, samples collected during bioaerosol testing within the ATF shall be analyzed for viable microorganisms. Approximately 1000 samples shall be analyzed by culture-based methods, and approximately 100 sample inocula shall be prepared over the course of this Task. The WAM will coordinate with those in the ATF group to ensure efficient transfer of samples between the laboratories. Data shall be reported to the WAM, and PI (indicated by the WAM), as data are available.

X. MILESTONES, DELIVERABLES, AND COMPLETION DATES

Data Delivery
Raw data (e.g., plate counts, qualitative growth results, etc.) shall be emailed to the WAM, and by carbon copy (cc) to the WAM of the project the microbiology lab is supporting, as soon as the data become available (not greater than 2 working days after completion of the analysis generating the data).

Reporting
The Contractor shall provide written quarterly status reports using an MS WORD format to the EPA Biocontaminant lab WAM. The reports shall be prepared specifying the following: (1) summary of work conducted during the preceding months, including tables and/or charts using MS EXCEL format, as appropriate, with sufficient annotation as deemed adequate by the EPA WAMs, (2) analyses of the work in accordance to the expectations specified by the QAPP of each project, (3) progress on each task and the reason for any deviations from the project schedule, (4) work anticipated during the coming quarter. These reports shall be submitted electronically near the end of each

quarter (July 1, September 30). Additionally, pdf copies of the laboratory notebook, including the pages documenting activities performed during the period, shall be created and delivered electronically to the WAM the same day the quarterly report is delivered.

XI. RESPONSIBILITIES

This WA will be managed by the USEPA Office of Research and Development, National Homeland Security Research Center (NHSRC), Decontamination and Consequence Management Division (DCMD) in Research Triangle Park, NC. The Work Assignment Contractor Officer Representative will be M. Worth Calfee (phone 919-541-7600, email Calfee.Worth@epa.gov).

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Biocontaminant Laboratory Technical Support Statement of Work
Description:	Laboratory Support Contract for NHSRC RTP On-Site Research Efforts needing microbiological support
Project ID:	HS6.02.01
Status:	
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	III
Security Classification:	Unclassified
Project Type:	Sampling and Analysis; Basic Research
QAPP Status 1:	Not Applicable
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027
	Work Assignment Number: 5-13
	Delivery/Task Order Number: n/a
	Modification Number: n/a
	Other: n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?

(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

N/A — Has a QAPP already been approved for the activities specified in the SOW?

No — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: NHSRC QMP, QAPP developed in accordance with Attachment #1
NHSRC QMP	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

2/5/14		Ramona Sherman 02/07/2014	
Worth Calfee NHSRC-DCMD Technical Lead Person	02/05/2014 Date	Ramona Sherman NHSRC-IO QA Staff Member	02/05/2014 Date

QAPP REQUIREMENTS FOR BASIC RESEARCH PROJECTS

(from Appendix B of the NHSRC QMP)

A basic research project is a study performed to generate data used to evaluate unproven theories, processes, or technologies.

SECTION 1.0, PROJECT OBJECTIVES AND ORGANIZATION

1.1 State the project objectives.

1.2 Identify the responsibilities of all project participants (*e.g.* QAPP preparation, sample collection and analyses, data reduction/validation/analysis, report preparation, QA).

SECTION 2.0, EXPERIMENTAL APPROACH

2.1 Describe the process, site, facility, apparatus, and/or environmental system to be tested.

2.2 Describe all known or pre-established test conditions and variables, including replicate experimental runs.

2.3 Describe the planned approach (statistical and/or non-statistical) for evaluating project objectives (*i.e.*, data analysis).

SECTION 3.0, SAMPLING AND MEASUREMENT APPROACH AND PROCEDURES

3.1 Complete the following table to summarize the sampling strategy to be used.

Sample/Measurement Location	Matrix	Measurement	Frequency	Experimental QC1	Total No. Samples

1QC samples generated during experiment, as applicable (*e.g.*, blanks, replicate samples, spikes)

3.2 Complete the following table to summarize the sampling and analytical procedures to be used.

Matrix	Measurement	Sampling/ Measurement Method1	Analysis Method1	Sample Container/ Quantity of Sample	Preservation/ Storage	Holding Time(s)2

1Provide details in text, as necessary, if standard method or SOP cannot be referenced
2Both to extraction and analysis, if applicable

SECTION 4.0, QA/QC CHECKS

Complete the following table to summarize QA/QC checks.

Matrix	Measurement	QA/QC Check1	Frequency	Acceptance Criteria	Corrective Action

1Include all QA/QC checks (experimental and analytical, as applicable) for accuracy, precision, detection limits, mass balance, *etc.* (*e.g.*, matrix spikes, lab control samples, blanks, replicates, surrogates)

SECTION 5.0, DATA REPORTING

Describe data reduction procedures specific to the project.

SECTION 6.0, REFERENCES

Provide references to methods and germane prior publications.

IN ADDITION, WHEN APPLICABLE ...

- list all project-specific target analytes (*i.e.*, when a class of compounds is specified in the table)
- indicate if reporting is on a wet or dry weight basis (solid matrices only)
- describe the method used to establish steady-state conditions
- describe how sampling equipment is calibrated
- describe how cross-contamination between samples is avoided
- describe the procedures used to collect representative samples
- describe sample packing and shipping procedures
- describe instrument calibration procedures and acceptance criteria if not included in a referenced method or SOP.

QAPP REQUIREMENTS FOR SAMPLING AND ANALYSIS PROJECTS

(from Appendix B of the NHSRC QMP)

A sampling and analysis activity or project is typically defined as a study performed to generate data to either monitor parameters on a routine basis or to characterize a particular population for later studies. The following requirements should be addressed as applicable.

SECTION 1.0, PROJECT DESCRIPTION AND ORGANIZATION

1.1 The purpose of the study shall be clearly stated in the sampling and analysis plan (SAP).

1.2 Responsibilities and points of contact for each organization shall be identified in the SAP. This should include identification of key personnel and/or organization(s) responsible for sample collection and custody, analytical and/or process measurements, data reduction, report preparation, and quality assurance.

SECTION 2.0, SAMPLING

2.1 Sampling points for all measurements (*i.e.*, analytical, physical, and process, including locations and access points) shall be identified in the SAP whenever possible. If the specific locations cannot be identified at the time of plan generation, discuss the documentation and/or communication mechanism(s) for ensuring adequate information is captured to later identify sampling points.

2.2 The anticipated sampling frequency (*e.g.*, how many sampling events and how often events occur) and number of sample types (*e.g.*, metals, VOCs, SVOCs, *etc.*) taken at each event shall be provided.

2.3 The expected measurements (*i.e.*, specific analytes) planned for each sample type shall be summarized.

2.4 If applicable, known site_specific factors that may affect sampling procedures shall be described.

2.5 If applicable, any site preparation (*e.g.*, sampling device installation, sampling port modifications) needed prior to sampling shall be described.

2.6 Each sampling procedure to be used shall be discussed or referenced.

2.7 If compositing or splitting of samples is planned, the applicable procedures shall be described.

2.8 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

2.9 Containers used for sample collection, transport, and storage for each sample type shall be described.

2.10 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*) shall be described.

2.11 Requirements for shipping samples shall be described.

2.12 Holding times requirements shall be noted.

2.13 Procedures for tracking samples in the laboratory and for maintaining chain_of_custody when samples are shipped shall be described. COC procedures shall be described to ensure that sample integrity is maintained (labeling, seals, records).

2.14 Information to be recorded and maintained by field personnel shall be discussed.

SECTION 3.0, TESTING AND MEASUREMENT PROTOCOLS

3.1 Each analytical method to be used shall be referenced. This includes EPA-approved and other validated nonstandard methods.

3.2 If applicable, modifications to EPA_approved or other validated nonstandard methods shall also be described.

SECTION 4.0, QA/QC CHECKS

4.1 The SAP shall list and define all QC checks and/or procedures used for the project, both field and laboratory as needed.

4.2 For each specified QC check or procedure, required frequencies and acceptance criteria shall be included.

SECTION 5.0, DATA REDUCTION AND REPORTING

5.1 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

5.2 The reporting requirements (*e.g.*, units, reporting method [*e.g.*, wet or dry]) for each measurement and matrix shall be identified.

SECTION 6.0, REPORTING REQUIREMENTS

The deliverables expected from each organization responsible for field and/or analytical activities shall be described.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

Category IV Project - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall

☐ address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-14

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Thermal Destruction of CBR Con
	Base X Option Period Number	

Contractor	Specify Section and paragraph of Contract SOW
ARCADIS U.S., INC.	

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
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4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Paul Lemieux (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-0962	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3670	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

PERFORMANCE WORK STATEMENT
for
Thermal Destruction of CBR Contaminants

PURPOSE OF WORK ASSIGNMENT

The contractor shall provide support for operation, maintenance, sampling/analysis, and modification to the in-house rainbow furnace and tests to combust cesium-doped biomass in the rainbow furnace and acquire and analyze samples from those tests. This work assignment is applicable to Contract Sections 1.2, 2.0, 3.0, 4.0, 5.0, 7.0, and 8.0.

BACKGROUND

In the aftermath of a Radiological Dispersal Device (RDD) in an urban setting, there is the potential for the generation of significant quantities of contaminated biomass. These wastes are likely candidates for incineration as a means for volume reduction, due to the costs of disposal for Low Level Radioactive Waste (LLRW). Cesium (Cs), a metallic element, is a likely radionuclide that may be used in an RDD, and presents problematic behavior in combustion systems due to its volatility and solubility in water. Unlike organic compounds, combustion or incineration systems cannot destroy the elemental metal constituents, although high temperature combustion environments will induce metal transformations. These transformations are usually thought to exacerbate their harmful effects, since many of the metal species, including Cs, readily vaporize within combustion environments. Subsequently, this saturated vapor will nucleate and condense downstream of the flame, contributing to a fume of submicron aerosol. These particles, because of their small size, are difficult to collect in pollution control systems. Emissions of particulate-bound radioactive isotopes, such as ^{137}Cs, from combustion systems, are highly undesirable. Moreover, chlorinated metal species that are collected often exhibit increased volatility, while chlorinated and sulfated metal species may exhibit increased water leachability.

The purpose of this research is to investigate biomass-bound Cs behavior, speciation, and transformations in combustion and incineration systems and examine methods and modifications to control Cs speciation and particle size distribution. One process of interest involves sorbent injection, whereby the high temperatures of practical incinerators might be exploited to transform Cs into constituents that are both more easily collected than Cs-containing effluents in the absence of combustion modifications.

Past work (Yoo et al., 2005; Lemieux et al., 2013) has shown that kaolinite, an alumino-silica sorbent can capture significant quantities of Cs fed into a combustion system. Experiments envisioned here will use the same small laboratory scale 82 kW in-house research combustor (rainbow furnace). Cs will be continuously introduced into the vertical furnace bound on ground corncob or other suitable ground biomass material, through a variable swirl burner. Kaolinite will be injected along the centerline in the post flame at a location based on the optimum temperature determined by Yoo et al. (2005).

Measurements of both the submicron aerosol size distribution and the size segregated particulate composition in the exhaust will allow the effects of sorbent injection to be ascertained. The presence of other naturally occurring alkali metals (Na and K) and Cl will be evaluated for their propensities to interfere or preferentially react with the sorbent.

Previous testing was performed (started under WA 2-41 and continued under WA 3-14) examining the combustion of cesium-containing biomass (corncob flour) in the Rainbow furnace, with the addition of sorbent to evaluate the sorbents' ability to capture cesium from the furnace flue gases. Based on analysis of the data, it was determined that it is necessary to run the test matrix using a different biomass (Pine Flour).

DETAILED TASK DESCRIPTIONS

Task 1) The contractor shall run additional cesium-contaminated biomass combustion experiments performed on the Rainbow furnace in the same manner as performed under WA 4-14, using the existing QAPP developed under WA 2-41. The following run conditions, along with associated sampling and analytical activities as per WA 2-41 and its QAPP, shall be performed in triplicate, for a total of approximately 10 days of testing:

- Pine Flour Alone
- Pine Flour/Cesium
- Pine Flour/Cesium/Sorbent

Additional elemental analysis of the sorbent material shall be performed using X-Ray Fluorescence (XRF).

Task 2) The contractor shall provide technical support, operating experience, analytical support, and expendable materials to conduct these tests using the EPA rainbow furnace. This support shall include:

- Provide expendable materials and building supplies to modify, operate, and maintain the rainbow furnace, or other in-house combustor, as appropriate.
- Provide engineering and operating labor for the design and execution of test plans on these furnaces.
- Maintain, calibrate, and operate monitoring equipment according to NRMRL/APPCD's Recommended Operating Procedures (ROPs) and instrument manuals.
- Collect and retain necessary operational data to ensure compliance EPA Safety, Health, and Environmental Management (SHEM) requirements.

DELIVERABLES

1. Planning Meetings: The WACOR and contractor's project manager shall arrange periodic project meetings to discuss Task-specific progress, issues, and action items.

2. Monthly Task Progress and Cost Reports: The Contractor's monthly report to EPA shall summarize work activities (accomplished and planned) in this work assignment, including the status of applicable test, QA, and safety plans. The monthly report shall also detail labor costs and ODC charges.

3. Health and Safety Research Protocols: Health and safety research protocols shall be prepared or updated as required by the EPA Facility and APPCD safety personnel. These protocols shall be approved by the WAM and safety personnel prior to the conduct of any testing.

4. Quality Assurance Project Plans (QAPPs): Existing QAPPs shall be updated as required by the EPA Facility and safety personnel. These protocols shall be approved by the WAM and safety personnel prior to the conduct of any testing. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

5. Data Reports: The Contractor shall prepare data summaries and Quality Control data reports of all facility-specific data in lieu of an overall final report. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.

References

Yoo, J., Shinagawa, T., Wood, J., Linak, W., Santoianni, D., King, C., Seo, Y., and J. Wendt, "High-Temperature Sorption of Cesium and Strontium on Dispersed Kaolinite Powders" Environ. Sci. Technol. 2005, 39, 5087-5094.

Lemieux, P., S. Lee, L. W., and C. Winterrowd, "Capture of Cesium During Biomass Combustion Using In-Furnace Sorbent Injection" in 2013 International Conference on Thermal Treatment Technologies and Hazardous Waste Combustors (IT3/HWC) 2013: San Antonio, TX.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-17

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Fenceline and Fugitive Emissio

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

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Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Eben Thoma (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7969 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 2-3-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

SOW: Fenceline and Fugitive Emissions Measurement Techniques

EP-C-09-027 WA 5-17, 6-month extension, Base (ending September 30, 2014)

Background:

Reducing fugitive and area source emissions of greenhouse gases (GHGs), hazardous air pollutants (HAPs), other volatile organic compounds (VOCs), and certain inorganic gases from industrial facilities, agricultural operations, energy production, and waste disposal, is an ongoing priority for EPA and our state and local co-regulators. Unlike stack emissions, fugitive and area source releases are difficult to detect and measure due to the spatial extent and inherent temporal variability of the potential sources.

Fenceline, process, and control system monitoring using new technical approaches (e.g. optical remote sensing (ORS), infrared cameras, hyper spectral imaging, mobile measurements, and emerging sensor network techniques) can augment manual leak detection and repair LDAR programs (where they exist) by providing speciated, and/or near real-time gas emissions. Time-integrated passive sampling is also important emerging screening approach (reference draft method 325A and B). The detection of fugitive emission by a time-resolved monitors, coupled with wind direction data, can be used to pinpoint and repair fugitive leaks with short response times, greatly decreasing the potential for emissions.

This work Assignment (WA) continues previous efforts in the fenceline and fugitive emission topic area. Please refer to EP-C-09-027 WAs: 2-43, 2-59, 3-17, 3-24, 3-37, 3-63, 3-70, 4-17, and 4-70 for background information on passive sampling, infrared cameras, deep ultraviolet optical sensor (DUVOS) technology, advanced UV and IR open path and point monitoring systems, low cost sensors, and mobile monitoring with geospatial measurement of air pollution (GMAP) approaches. This goal of this WA is to consolidate and continue development of select aspects of these technologies, demonstrate them in the field where possible, and document them through method development activities. Aspects of this WA will work in concert with WA 5-70.

Work involving collection of environmental data shall not commence until the quality assurance documentation has received official approval from the EPA Quality Assurance Staff. The Quality Assurance Project Plans (QAPPs) associated with these tasks shall be a Category III level (unless otherwise specified) and must include all necessary elements as described in the referenced documentation (See Attachment 1).

All QAPPs and QAPP addendums shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page.

For the each of the tasks described below, the contractor shall provide itemized hours and cost estimates as part of the workplan.

Tasks and Deliverables:

Task 1: Execution of EPA R8 RARE oil and gas well pad enclosed combustor study.

During the past decade, oil and gas extraction and production (E&P) activities have increased dramatically in many areas of the United States. Improperly maintained or controlled upstream production processes have the potential to emit significant amounts of pollutants that may impact local and regional air quality. In particular, upstream E&P sources can emit volatile organic compounds (VOCs), which include ozone formation precursors, hazardous air pollutants (HAPs), and greenhouse gases (GHGs). It is important to quantify both the control efficiency and the speciation of emissions from control-related devices used in oil and gas operations, particularly enclosed combustors (ECDs).

The objective of this task is to prepare, execute, and report on a two to three-week field research study to be conducted in Greeley, CO (target August, 2014) that investigates emissions from well-pad ECDs.

Building on the technical, logistical, and quality assurance planning work initiated under EP-C-09-027 WA 4-17 Task 6, the contractor shall complete all preparations for the field study, execute field measurements, and produce a short-form report on data before the end of the option period 5 extension end date (Sept 30, 2014). Under the technical direction of the work assignment manager (WAM) and in consultation with the EPA R8/ORD study team, the contractor shall:

- Complete deployment / technical feasibility analysis of ECD measurement approaches[1]
- Provide options for a pilot demonstration of selected measurement approach[1]
- Complete QAPP for a one to two week field study (Greeley, CO area, target Aug., 2014)
- Execute, manage, support any necessary subcontracts for the study
- Provide as short-form report on field work including all data, notes, and QA information

[1.] If not completed under WA 4-17 Task 6

The contractor shall investigate the feasibility of various technical approaches for in-field combustor control efficacy and other well pad emissions measurements (on-site and/or remote) including acquisition and analysis of the required speciated emission profiles to support the air quality modeling work to be conducted by EPA. The contractor shall produce an analysis of the number E&P well pads that must be sampled in order to provide statistically valid results for a given basin. The contractor shall participate in regular team meetings to discuss various technical approaches and shall provide an analysis of in-field measurement and laboratory analytical options for the envisioned field measurement and modeling project. The options analysis shall include estimates on field time per well pad and cost per data point for both remote and on-site measurement approaches.

Deliverable 1.1: Options analysis on or before April 30, 2014

Deliverable 1.2: Final QAPP on or before June 13, 2014

Deliverable 1.3: Execute field study by September 15, 2014

Deliverable 1.4: Short form report and data package by September 30, 2014

Task 2: General support of emissions, fenceline, and fugitive monitoring projects

Under the technical direction of the WAM, the contractor shall provide support to EPA's fugitive and area source group in the general development, preparation, maintenance, upgrade, and testing of ORS, infrared camera, passive and active fenceline, and mobile measurement equipment, methods, reports, and databases. This task shall include machine shop time to procure and construct support materials for passive samplers, sensor systems, mobile systems etc., as per EPA design, for projects pursued by the EPA fugitive and area source group and its collaborators.

The contractor shall revise and update fenceline and mobile measurement SOPs and QAPP addendums as required based on field study changes, technical advances, and deployment needs. The contractor shall revise, update, and document, previously delivered products from WA 4-17 as per EPA comments (to be received) including: infrared camera database, time-resolved fenceline monitoring method, and CO_2 sequestration projects. The contractor shall support potential revisions to previous report products that are currently under additional EPA and external review (as required).

The contractor shall support the development of data analysis procedures for source emissions, fenceline, and mobile measurements and in the processing of said data on an as required basis. For any data analysis activity, the contractor shall provide a short-form data analysis report, including QA summaries in Microsoft Word™ and Excel™ formats along with all raw and processed files and spectral fits for the provided data.

For planning purposes, the contractor shall assume approximately 1.5 man days per week on average of general support needs under this task with no travel requirements. The contractor shall assume no more than $5,000 of materials, supplies, and software development costs associated with this general support task.

Deliverable: Project support shop functions, database/report revisions, QA packages and data reports delivered within 30 calendar days of receipt of information from EPA WAM (on and as required basis). Work to be completed before September 30, 2014

Task 3: Sensor statistical data processing technique development

Under the technical direction of the WAM, the contractor shall provide support to EPA's fugitive and area source group in the general development of new data analysis approaches for mobile and fenceline sensor systems. In 2013 and early 2014, literature searches and pilot scale investigations into the potential for statistical-based processing of sensor data where conducted under the APPCD statically support contract. These approaches combine atmosphere turbulence statistics coupled with analysis of concentration time series using a variety of statistical analysis approaches. In this task, the contractor shall advance this research effort with aim to produce usable approaches for field testing in combination with other programs. The contractor shall assume periodic meeting to discuss technical aspects of research design and progress.

Deliverable 3.1: Draft QAPP by May 16, 2014

Deliverable 3.2: Project update by July 11, 2014

Deliverable 3.3: Short form research analysis summary by September 30, 2014

ATTACHMENT #1
TO THE STATEMENT OF WORK (SOW)

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD:

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

☐ **NRMRL=s Quality System Specifications:**

(1) a description of the organization=s Quality System (QS) and information regarding how this QS is documented, communicated and implemented;

(2) an organizational chart showing the position of the QA function;

(3) delineation of the authority and responsibilities of the QA function;

(4) the background and experience of the QA personnel who will be assigned to the project; and

(5) the organization=s general approach for accomplishing the QA specifications in the SOW.

☐ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

☐ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

X **QAPP Requirements for Secondary Data Projects**

☐ **QAPP Requirements for Research Model Development and Application Projects**

☐ **QAPP Requirements for Software Development Projects**

X QAPP Requirements for Method Development Projects

☐ **QAPP Requirements for Design, Construction, and Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA=s Quality System Website: http://www.epa.gov/quality/
EPA=s Requirements and Guidance Documents:
http://www.epa.gov/quality/qa_docs.html

NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS: Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.

4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.

4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.

4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.

4.5 Describe the method for uniquely numbering each sample.

4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5. MEASUREMENT PROCEDURES

5.1. Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.

5.2. If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6. QUALITY METRICS (QA/QC CHECKS)

6.1. For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.

6.2. Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7. DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.

7.2 Describe data validation procedures used to ensure the reporting of accurate project data.

7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).

7.3.1 If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.

7.3.2 If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.

7.4 Describe data storage requirements for both hard copy and electronic data.

8. REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.

8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-20

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Fate and Transport of Radiolog

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

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This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Sangdon Lee (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-4531	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3670	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

Statement of Work

For WA 5-20

Fate and Transport of Radiological Dispersal Device (RDD)

Task: The contractor shall prepare a test report based on the results from WA 4-20 tasks (a draft for WAM review and approval; a revised draft for peer and QA review; and a final) which shall include the test conditions, methods, quality assurance, and results of the tests conducted per the requirements of this SOW. The report shall conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

Laboratory data shall be transferred electronically to the EPA WAM after the conclusion of each trial or series of tests. These data shall include, but not be limited to, active ingredient concentration levels, pH, temperature, RH, and viable organism counts for test and control coupons.

The contractor shall record the chamber setup and testing procedure in video format and the recording shall be made whenever there are different setups or testing procedures. The video record shall be transferred to the EPA WAM.

Project Deliverables for Fate and Transport of RDD:

Deliverables	Date of Completion
Report	July 31st 2014

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Fate and Transport of Radiological Dispersal Device: pressure washer application	
Description:	Decontamination of Radiological Dispersal Devices (RDD) Cs contamianted outdoor surfaces as a function of water pressure, wash duration, and deposition type using pressure washer	
Project ID:	C.2.1.1	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Not Delivered	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-c-09-027
	Work Assignment Number:	20
	Delivery/Task Order Number:	n/a
	Modification Number:	0
	Other:	n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Sang Don Lee 2/28/2014

Sang Don Lee
- Technical Lead Person Date

- QA Staff Member Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies

required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA_approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations (including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA

To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994 American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-21

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Modification and Testing of Tr
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Paul Lemieux	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-0962
	FAX Number:
Project Officer Name: Kevin Sudderth	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-3670
	FAX Number:
Other Agency Official Name	Branch/Mail Code:
(Signature) (Date)	Phone Number:
	FAX Number:
Contracting Official Name: William Yates	Branch/Mail Code:
William Yates 3-27-14	Phone Number: 513-487-2055
(Signature) (Date)	FAX Number:

PERFORMANCE WORK STATEMENT

MODIFICATION AND TESTING OF TRANSPORTABLE GASIFIER FOR ANIMAL CARCASSES

OMIS DCMD C.4.1.1.3
(APPCD ON-SITE CONTRACT EP-C-09-027)
WA 5-21

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TABLE OF CONTENTS

I. TITLE
Modification and Testing of Transportable Gasifier for Animal Carcasses

II. PERIOD OF PERFORMANCE
The period of performance for the work under this work assignment shall be Award – 9/30/14.

III. SUMMARY OF OBJECTIVES
The objective of this work assignment is to make repairs and modifications to the gasification system, and to run an optional Proof of Concept test on swine and poultry in a real world scenario.

IV. RELEVANCE
A comprehensive response strategy is required to effectively mitigate animal health emergencies (i.e. high –consequence foreign animal diseases) and maintain continuity of business to the maximum extent practicable. This response strategy must incorporate plans and technologies for rapid depopulation, decontamination, and disposal of affected animals. This technology could be used as a disposal option for animal carcasses following a disease outbreak.

V. BACKGROUND
This project is a combined effort between the Environmental Protection Agency (EPA) and the Department of Homeland Security (DHS). EPA and DHS are committed to using cutting edge technologies and scientific talent in our quest to make America safer.

A comprehensive response strategy is required to effectively mitigate animal health emergencies (i.e., high–consequence foreign animal diseases) and maintain continuity of business to the maximum extent practicable. This response strategy must incorporate plans and technologies for rapid depopulation, decontamination, and disposal of affected animals. Current response strategies which rely on stop-movement orders, quarantine, depopulation, carcass disposal, and limited application of available vaccines, are inadequate to meet the logistical challenges of large and/or multifocal outbreaks. Furthermore, these response efforts fail to manage or mitigate the psychological, social, economic, trade, social, or environmental consequences. There is a critical need to develop new and/or enhanced animal health emergency response strategies, tools, and technologies in order to increase capacity and to ensure that depopulation, decontamination, and disposal (3D) activities are handled as rapidly and as humanely as possible.

During the past five years, an interagency team, including USDA, the EPA, the Department of Defense (DoD), and the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) has been collaborating on a project managed by the DoD's Technical Support Working Group (TSWG), involving the poultry and swine industries, to develop a technology to dispose of animal carcasses resulting from disease or natural disaster by mobile maceration and thermal gasification.

Early tests showed promise in a prototype equipment package designed and constructed to process 25 tons or more of swine or poultry carcasses in a day, with the system being expandable with multiple units to process up to 200 tons or more of carcasses daily. Initial field testing of the prototype indicated that many of the design requirements were successfully met and tested, but some design flaws in the prototype created limitations in achieving the desired feed rate.

This Performance Work Statement (PWS) describes an effort to make needed repairs and modifications to the system, and to run an optional Proof of Concept test on swine and poultry in a real world environment. Such technology would provide the basis for strategically placed gasifier units around the country that could respond to diseases or disaster in a timely manner and provide an environmentally sound carcass disposal option.

With repair, enhancement, modification of the prototype system and effective training of an operating staff, the macerator and gasifier system should be able to safely process 25 tons or more of poultry or swine carcasses per day. The current prototype does not have the capability of processing large animal carcasses such as bovine or equine due to cost savings achieved on the macerator purchase that is with

the unit. The addition of a pre-breaker would enable large animals to be processed. Another important note is that the macerator unit is on a self-contained trailer and could be used in conjunction with other large-scale technologies that DHS might be interested in developing and testing.

The prototype was located in Wallace, North Carolina for an extended period of time, but is now in Burlington, NC having parts be fabricated and installed. Although some of the components (e.g., generator) have received routine maintenance, there has been some deterioration of some components due to the unit having not been operated for an extended period of time.

VI. SCOPE

The existing gasifier prototype shall be repaired to restore the components that are not being replaced in the activities of other tasks to their functional state. This shall include repair of the outer shell, refractory, ash discharge auger, trailers, control system, door assemblies, electrical components, generator, macerator, and feed system. All repairs shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

VII. TECHNICAL APPROACH

This is a follow on work assignment from the previous option period. A plan has been developed on how to proceed with the modification of the gasifier system. A list of suggested repairs shall be submitted by the contractor to the EPA Work Assignment Contracting Officer's Representative (WACOR) for consideration prior to initiating any repairs. Written authorization will be provided by WACOR on repairs that shall be completed. Once the repairs have been completed a series of shakedown tests shall be planned based on discussions between the EPA WACOR and the contractor.

VIII. AFFORDABILITY

This effort is labor intensive, which is where the bulk of the funding is required. The contractor shall determine which materials are necessary to repair the gasifier. Large capital equipment items will be procured by the EPA with smaller items being procured by the contractor. The unit is currently located in Burlington, NC and moving all the components of the unit is not financially feasible, so it may be necessary to subcontract with someone in the Rose Hill area to assist in repair/upgrade of the unit.

IX. TECHNICAL RISK

The technical risk involved in this project is minimal. The ultimate goal is to test the throughput operation of the gasifier using swine and poultry.

X. FACILITIES AND MATERIALS

All experimental efforts shall be performed by the contractor in Rose Hill, NC. If deemed feasible, the gasifier unit may be moved to Research Triangle Park, NC for repairs if the contractor and WAM decide this is the most feasible way to repair the unit.

XI. TASKS

The following tasks are defined as part of this work assignment:

Task 1: Repair the damaged and deteriorated components of the gasifier prototype

The existing prototype shall be repaired to restore the components that are not being replaced in the activities of other tasks to their functional state. This shall include repair of the outer shell, refractory, ash discharge auger, trailers, control system, door assemblies, electrical components, generator, macerator, and feed system. All repairs shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

Task 2: Replace the oil-fired burners and associated equipment with gas-fired burners

The initial design decision to use oil-fired burners, although noble in its intent of minimizing logistics associated with fuel delivery by having the generator and burners use the same fuel, resulted in significant operational difficulties, including difficulty igniting, poor turndown ratios, and unreliable

operation. The unit will be refitted with gas burners that burn LP or natural gas, and associated piping, fuel delivery, flame safety, and process control hardware. All new equipment installations will be documented using Computer Aided Design (CAD) tools and all revised design drawings will be collected into a system documentation manual in both electronic and hard copy form.

Task 3: Modification of the feed system
The initial feed system design required manual actuation of the feeding valves from the top of the gasifier to distribute the feed onto the gasifier's hearth. The initial feed system also had a side effect that a volume of material equal to the amount of material fed into the macerator was introduced onto the hearths. This required paying significant attention to the introduction of material into the macerator, and caused operational difficulties when large animals were fed into the macerator. The feeding system shall be redesigned to decouple the quantity of material fed into the macerator from the quantity of material distributed onto the gasifier's hearth. In addition, the material transport system shall be re-evaluated to potentially use an auger rather than a pump. In addition, the control of the valves to distribute the feed across the gasifier hearths shall be automated with a manual override at ground level. The feed system shall be able to operate under negative draft to reduce the potential of contamination via aerosols escaping the system. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

The feed system shall also include a mechanism to distribute the feed material across the hearth. One design that has been discussed is a raking mechanism that can distribute the material and push the ash toward the ash auger.

A pre-breaker shall be added to the system and shall utilize the existing pump to the extent that it is possible. The pre-breaker will be used to handle larger animals such as bovine.

This follow-on work assignment assumes that the fabrication of the feed system was completed as part of WA 4-21.

Task 4: Develop training materials for operational personnel
Training materials shall be developed for operational personnel to encompass mobilization, field assembly, operation, cleaning, maintenance, repairs, troubleshooting, and demobilization. Training materials shall be delivered in both hard copy and electronic forms.

Task 5: Evaluate and modify control system for the gasifier including the revised feed system
The electrical system, control system, and associated equipment shall be tested and modified (if necessary) to assure that the gasifier can operate safely from a suitable location in all weather conditions. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form.

Task 6: Documentation
As part of this task, the contractor shall evaluate and document the system, its operation, required maintenance, performance, and any other modifications or improvements. All new equipment installations shall be documented using Computer Aided Design (CAD) tools and all revised design drawings shall be collected into a system documentation manual in both electronic and hard copy form. A complete set of all of this documentation shall be placed with the unit in a weather protected container and provided to the project officer. It is anticipated that a total of 5 sets of documentation shall be provided.

Task 7: Shakedown Testing Once the modifications and repairs have been completed, the project operating team shall conduct a series of shakedown tests to optimize the performance of the unit, properly adjust the system, train personnel to safely and reliably operate it in the field, and perform at the highest throughput possible. Information shall be used to develop and design operations, maintenance, repair, assembly, disassembly and transportation material for reference and training. A Quality

Assurance Project Plan shall be developed by EPA and approved, prior to any testing, to address any measurements to be taken as a part of this testing.

As part of this testing a Health and Safety Protocol (HASP) prior to any shakedown or throughput testing. The contractor shall provide a copy of the HASP to the EPA WACOR so that the WACOR can file with the ORD-SHEM office.

Task 8: Maximum Throughput Continuous Operation Test (Optional)

The contractor shall carry out and document a three-day Proof of Concept (PoC) test at the highest throughput safely possible. It is anticipated that a 72 hour continuous test shall be required as part of this task. Upon completion of the test, the contractor shall clean and disinfect the equipment and test area, and prepare the system for relocation. The contractor shall prepare an After Action Report (AAR) based on the project activity and the results of the test. A Quality Assurance Project Plan shall be developed and approved, prior to testing, to address any measurements to be taken as a part of this testing.

Task 9: Clean, Decontaminate, Disassemble, Secure for Transport (Optional)

The contractor shall clean, decontaminate, disassemble, and securely package the gasifier system, including macerator, for transport to a location identified by the North Carolina Department of Agriculture and Consumer Services for staging. If the Contractor does not have the capacity to transport the system once it is packaged, a heavy rigging/trucking company shall be hired by the contractor to transport and unload the system at the designated location. The location is anticipated to be in the Raleigh, NC area.

XII. DELIVERABLE SCHEDULE

- On a monthly basis for the duration of the project, the contractor shall submit, in electronic format, progress reports summarizing technical progress (including estimated percent of project completed), problems encountered, quarterly and cumulative financial expenditures and cost and schedule variance.

- A draft After Action report shall be delivered to the EPA WAM within 8 weeks of the conclusion of Task 8.

Deliverable Schedule

Deliverable	Date
Fabricated Gasifier	3 months after award
Data summaries	On-going
Equipment Documentation and training materials	Draft prior to Task 8, final 6 weeks after conclusion of Task 8
After Action Report	8 weeks after conclusion of Task 8

XIII. REPORTING REQUIREMENTS

- The Contractor shall prepare Quality Control data reports of all facility-specific data. Each Quality Control report shall be in a format suitable for EPA/NHSRC publication and shall discuss how well various measurements described in the QA plan were met.
- The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action\. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.
- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.

- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-22

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Raleigh Near Road Site

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (*Max 2*) ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Sue Kimbrough (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-2612	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3670	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates (Signature) 4-3-14 (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

STATEMENT OF WORK

TABLE OF CONTENTS

1 TITLE: Raleigh Near-Road Site Infrastructure

2 DATE: April 2, 2014

3 BACKGROUND

EPA in collaboration with the Federal Highway Administration (FHWA) has conducted two long-term near-road studies in Las Vegas, NV and Detroit, MI. The Las Vegas study was completed in March, 2010 and the Detroit study was completed in June, 2011. A principal driver behind these studies was a Settlement Agreement between FHWA and Sierra Club to perform near-road air pollution studies.

On January 22, 2010, EPA strengthened the health-based National Ambient Air Quality Standard (NAAQS) for nitrogen dioxide (NO_2). To determine compliance with the new standard, EPA established new ambient air monitoring and reporting requirements for NO_2. At least one monitor must be located near a major road in any urban area with a population greater than or equal to 500,000 people. Raleigh, NC is such an urban area.

For the study covered by this SOW, EPA will be collaborating with the North Carolina Department of Environment and Natural Resource's (NCDENR) Air Quality Division and FHWA regarding a near-road air pollution study. This collaboration leverages resources of all three agencies with regards to establishing a long-term study site for EPA's near-road research program and interest in air pollution control strategies and exposure assessment, a long-term near road NO_2 monitoring site for NCDENR, and a long-term near-road site for FHWA's interest in identifying effective strategies for mitigating air pollution from transportation sources.

The Raleigh Near-Road site will function as a multi-pollutant measurement research site that will include (but not limited to) NO, NO_2, NOX, CO, BC, mobile source air toxics (MSATs), particulate ($PM_{2.5}$), ultrafine particulate, etc. The objective of the research study is to determine mobile source air pollution concentrations and variations in concentrations as a function of distance from the highway and to establish relationships between mobile source air pollution concentrations as related to highway traffic flows including traffic count, vehicle types and speeds; and meteorological conditions such as wind speed and wind direction. As such, the

Raleigh Near-Road study would be expected to provide data detailing concentrations and distributions of motor vehicle emitted pollutants including regulated gases, air toxics, and particulate matter. Specifically, the data will be used to address the following goals:

1. Identify the existence and extent of elevated air pollutants near roads.
2. Determine how vehicle operations and local meteorology influence near road air quality for regulated and air toxic pollutants.
3. Collect data that will be useful in evaluating and refining, if necessary, models used to determine the emissions and dispersion of motor vehicle related pollutants near roadways.

The following site is currently selected and monitoring is underway:

1. Raleigh, NC

4 APPLICABLE, CONTROLLING DOCUMENTS AND WEB SITES:

"Monitoring Protocol", Attachment A to this document (previously provided under EP-C-09-027, WA 2-39); Also located at this URL:
http://www.fhwa.dot.gov/environment/air_quality/air_toxics/research_and_analysis/near_road_study/

FHWA's The National Near Roadway MSAT Study Web Page --
http://www.fhwa.dot.gov/environment/airtoxicmsat/

Office of Environmental Information. **EPA Requirements for Quality Assurance Project Plans,** EPA QA/R-5**,** EPA/240/B-01/003, U.S. Environmental Protection Agency. March 2001. http://www.epa.gov/quality/qs-docs/r5-final.pdf.

Office of Environmental Information. **Guidance for Quality Assurance Project Plans** (QA/G-5), EPA /240/R-02/009, U.S. Environmental Protection Agency. December 2002, http://www.epa.gov/quality/qs-docs/g5-final.pdf.

5 TECHNICAL REQUIREMENTS/TASK DESCRIPTION:

The technical basis for this effort will be the "Monitoring Protocol" – Attachment A. The contractor shall perform the Monitoring Protocol as described in Attachment A of this document (previously provided under EP-C-09-027, WA 2-39). The contractor shall propose alternative methods/approaches that may yield cost-savings over the life of the project. These alternative methods/approaches should be construed as encompassing all aspects of the project.

Before this work is initiated the contractor shall meet with the EPA researchers to ensure that the objectives of this project and the resource boundaries are understood.

5.1 Raleigh Near-Road site

5.1.1 Study Site/City Site

The near-road study site was selected in collaboration with North Carolina DENR Air Quality Division staff. Throughout the rest of this SOW the site will be referenced as the Raleigh Near-Road site or Triple Oak site.

The terms "location" and "site" shall be interpreted to include the AIRS site as well as the Triple Oak site that will be operated for the duration of this study as required by the specific needs of this project. A GoogleMaps image of the site is provided as Attachment B.

5.1.1.1 Site Infrastructure

The contractor shall be responsible for negotiating and maintaining all of the necessary leasing, site operation permits, electrical connections, security/insurance arrangements to operate this site for the duration of the study as required by the specific needs of this project. The contractor shall be responsible for maintaining (including but not limited to) shelter condition/integrity and HVAC operations. The contractor shall be responsible for payment of electricity and communication (data and phone) costs incurred at the Raleigh air monitoring sites. The contractor shall be responsible for ensuring appropriate calibration gases are made available for the duration of the study as required by the specific needs of this project.

5.1.1.2 Training Activities

The contactor shall be responsible for arranging training on equipment as required by the specific needs of this project. This training would include analyzers, data loggers and data

logging software. While instruments concepts are similar among the same instrument types, actual instrument operations may differ significantly between different vendors. Thus training is needed to understand specific instrument, data loggers and software utilized by this project.

5.1.1.3 Field Deployment

5.1.2 Commencement of Site Operations

Site operations commenced during a previous work assignment (EP-C-09-027, Opt. 4, WA-22). Remote monitoring of instrumentation will be performed by EPA staff at the RTP Facility utilizing a PC running WinAQMS/WinCollect. When instrument performance issues occur, a site operator will be dispatched on an as needed basis and as resources permit.

5.1.2.1 Pollutants of Interest

The contractor shall collect monitoring data for the pollutants of interest as required by the specific needs of this study. The pollutants of interest are as follows:

Pollutant	Surrogate Species	Monitoring Method	Frequency	Sampling Period	Samples / Sampling Frequency	Samples/Year
Sulfur Dioxide		continuous	Continuous	Continuous	Continuous	Continuous
Carbon Dioxide		continuous	Continuous	Continuous	Continuous	Continuous
Ultrafines		continuous	Continuous	Continuous	Continuous	Continuous
Diesel Particulate Matter	Carbon Monoxide	continuous	Continuous	Continuous	Continuous	Continuous
	Nitrogen Oxides	continuous			Continuous	Continuous
	Black Carbon	Aethalometer continuous			Continuous	Continuous
	$PM_{2.5}$	SHARP	Continuous	Continuous	Continuous	Continuous
1,3-butadiene, benzene (including other btex compounds)		Continuous	Continuous	Continuous	Continuous	Continuous

5.1.2.2 Meteorological Instrumentation

The contractor shall provide logistical support with regards to the operation of the following suite of meteorological instrumentation: 3-D sonic anemometer, temperature probe, relative humidity sensor, solar radiation sensor, barometric pressure sensor, and rain gauge. The

contractor shall assist with the operation and trouble-shooting of these instruments on an as needed basis and as identified by the WACOR.

5.1.2.3 Other Instrumentation/analyzers.

The contractor shall assist with the operation and calibration on an as needed basis the following instruments: two Chromatotec semi-continuous GCs. The contractor shall assist with the installation, operation and calibration of an Aerodyne CAPS NO_2 instrument. The contractor shall assist with the installation, operation, calibration and trouble-shooting of other instruments/analyzers that may be identified by the WACOR as needed for the Raleigh Near-Road Multi-Pollutant site.

5.1.2.4 Data Completeness

The contractor shall collect monitoring data with completeness criteria as shown in the table below and as required by the specific needs of this study.

Pollutant	Sampling Approach	Accuracy	Precision	Data Completeness
Carbon dioxide	non-dispersive infrared	20%	10%	80%
Carbon monoxide	Continuous monitoring (NDIR FRM CO analyzer)	20%	10%	80%
Nitrogen oxides	Continuous monitoring (Chemiluminescence NOx analyzer)	20%	10%	80%
Ozone	Continuous monitoring UV photometry	20%	10%	80%
NO2	Continuous monitoring Optical absorption spectrometer	20%	10%	80%
Black carbon (surrogate - diesel)	Continuous monitoring (Aethalometer)	5%	5%	80%
$PM_{2.5}$	Continuous monitoring (SHARP)	20%	10%	80%
Ultrafines	Continuous monitoring (TSI)	20%	10%	80%
$PM_{2.5}$	Integrated filter sampling ($PM_{2.5}$ FRM method)	20%	10%	90%
Continuous GC				
Benzene (MSAT)	Continuous GC	10%	5%	80%
1,3-Butadiene (MSAT)		10%	5%	80%
Other BTEX compounds		10%	5%	80%

5.1.2.5 Maintenance of Equipment

The contractor shall be responsible for the proper maintenance of equipment as required by the needs of this study.

5.1.2.6 Supplies and Other Miscellaneous Equipment

The contractor shall purchase or otherwise have available any additional miscellaneous equipment or supplies that may be needed for successful completion of this effort. The contractor shall consult with the EPA WAM and other EPA technical representatives prior to purchasing items in excess of $2,000.

The contractor shall lease or purchase as needed the required supplies such as calibration gases and other miscellaneous equipment not already specifically identified as required by the needs of this study.

5.1.3 Traffic Monitoring and Vehicle Classification

Traffic data is being collected by NC DOT. In addition, this task utilizes an existing traffic sensor equipment to collect traffic data.

5.1.3.1 Statistical Analysis

The contractor shall provide logistical support for (but is not limited to) the preparation of tables, graphs, text, etc. that would be used to create report(s) as required by the needs of this study. The results of statistical analyses or other relevant calculations shall be provided to the EPA WAM in the required QA/QC audit reports, quarterly data reports and a final report as required by the specific needs of this study. The contractor shall consult with the EPA WAM and other EPA technical representatives on the nature of the statistical software prior to implementation.

5.2 Quality Assurance Project Plan (QAPP)

The applicable QAPP QTRAK # is 07035-A12395. This is a previously approved QAPP.

This QAPP is a "living document" and as such may require modifications as required by the needs of this study. The contractor shall provide input and revisions to the QAPP as required

by the needs of this study. The QAPP that results from this task will be included as an Appendix to the final report.

The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form" and the NRMRL QA Requirements/Definitions List included with this effort. The work to be performed falls under the QA requirements for "**Measurement**" projects, Category III. See http://intranet.epa.gov/nrmintra/lsas/eqmp/pdf/MeasurementQAPPNRMRLrev0.pdf. WACOR will prepare an addendum to the existing QAPP with input from the contractor.

5.3 Safety Plan

The contractor shall revise as necessary the Safety Plan previously developed under Contract EP-C-09-027, WA 4-22.

5.4 Project Reports

The contractor shall provide monthly reports as required by the specific needs of this study. Section 8 of the Monitoring Protocol (Attachment A) contains the relevant details.

6 DEFINITIONS:

Air Monitoring Station -- Air monitoring stations are shelters containing the air sampling instrumentation including the meteorological instrumentation, data logging hardware, software, communications and any other equipment and supplies as required by the specific needs of the FHWA Detailed Monitoring Protocol. For this project, air monitoring stations may be standard utility trailers or converted shipping containers.

7 REPORTING REQUIREMENTS

1. The EPA WAM and other EPA technical representatives have developed a QAPP for the Raleigh implementation under a previous WA (EP-C-09-027, WA 4-22). This QAPP is a "living document" and as such may require modifications as required by the needs of this study. The contractor shall provide input and revisions to the QAPP as required by the needs of this study. The specific details of the required QAPP are discussed in a previous section of this SOW.

2. The contractor shall schedule monthly conference calls with the EPA WAM during which task progress and issues will be discussed. The contractor shall summarize the notes from each of these conference calls in the form of an e-mail message to the EPA WAM.

3. The contractor shall provide monthly reports as required by the specific needs of this study. Section 8 of the Monitoring Protocol contains the relevant details.

DELIVERABLES

1. The EPA WAM and other EPA technical representatives have developed a QAPP for the Raleigh implementation under a previous WA (EP-C-09-027, WA 4-22). The contractor shall provide input and revisions to the QAPP as required by the needs of this study. The specific details of the required QAPP are discussed in a Section 5.2 of this SOW. This QAPP shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form" and the NRMRL QA Requirements/Definitions List included with this effort. The work to be performed falls under the QA requirements for "**Sampling and Analysis**" projects, Category III. See **EPA Requirements for Quality Assurance Project Plans,** EPA QA/R-5**,** EPA/240/B-01/003, March 2001, http://www.epa.gov/quality/qs-docs/r5-final.pdf. Additional guidance with regards to sampling and analysis QAPP requirements may be found in Chapter 2 of the Guidance for Quality Assurance Project Plans (QA/G-5), EPA /240/R-02/009, December 2002, http://www.epa.gov/quality/qs-docs/g5-final.pdf. This QA/QC plan shall be provided to the EPA WAM in an MS Word format (1 electronic & 5 hardcopies).

2. The EPA QA Representative will provide written & oral comments to the EPA WAM and other EPA technical representative's contractor within 6 weeks of the delivery of the QA/QC plan (Item 1 above).

3. The contractor shall prepare monthly reports as required by the specific needs of this study. These reports shall be provided to the EPA WAM in an MS Word format (1 electronic & 5 hardcopies).

The EPA WAM will provide written and oral comments to the contractor within 7 days of the delivery of the monthly report.

Summary of Deliverables		
Item	**Description**	**Due Date**
a	QA/QC Plan	Previously developed under WA 4-22
b	Email Summaries	2-days after each conference call
c	Monthly Reports	10-days after end of month

8 SPECIAL TERMS AND CONDITIONS

Attachment	Contents
A	Monitoring Protocol (Supplied under EP-C-09-027, WA 2-39)
B	Site Map
C	QA Requirements

ATTACHMENT #1 TO THE STATEMENT OF WORK (SOW) FOR MEASUREMENT PROJECTS

NRMRL Quality Assurance (QA) Requirements

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation specified herein. All quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approved the quality documentation. The quality documentation shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government. Any EPA-funded project/program may be subject to a QA audit.

TO BE SUBMITTED PRE-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function;
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

TO BE SUBMITTED POST-AWARD (mark all that apply):

□ **NRMRL's Quality System Specifications:**

(1) a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;
(2) an organizational chart showing the position of the QA function; 07/14/08 A-2
(3) delineation of the authority and responsibilities of the QA function;
(4) the background and experience of the QA personnel who will be assigned to the project; and
(5) the organization's general approach for accomplishing the QA specifications in the SOW.

□ **Quality Management Plan:** prepared in accordance with R-2 - EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001, http://www.epa.gov/quality/qs-docs/r2-final.pdf

□ **Category I or II Quality Assurance Project Plan (QAPP):** prepared in accordance with R-5 - EPA Requirements for QA Project Plans (EPA/240/B-01/003) March, 2001 http://www.epa.gov/quality/qs-docs/r5-final.pdf

X **Category III or IV QAPP:** prepared in accordance with applicable sections of the following NRMRL QAPP Requirements List(s) which is(are) included in this attachment:

X **QAPP Requirements for Measurement Projects**

□ **QAPP Requirements for Secondary Data Projects**

□ **QAPP Requirements for Research Model Development and/or Application Projects**

□ **QAPP Requirements for Software Development Projects**

□ **QAPP Requirements for Method Development Projects**

□ **QAPP Requirements for Design, Construction, and/or Operation of Environmental Technology Projects**

ADDITIONAL QA RESOURCES:

EPA's Quality System Website: http://www.epa.gov/quality/
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html

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NRMRL QAPP REQUIREMENTS FOR MEASUREMENT PROJECTS

GENERAL REQUIREMENTS:

Include cover page, distribution list, approvals, and page numbers.

0. COVER PAGE

Include the Division/Branch, project title, revision number, EPA technical lead, QA category, organization responsible for QAPP preparation, and date.

1. PROJECT DESCRIPTION AND OBJECTIVES

1.1 Describe the process and/or environmental system to be evaluated.
1.2 State the purpose of the project and list specific project objective(s).

2. ORGANIZATION AND RESPONSIBILITIES

2.1 Identify all project personnel, including QA, and related responsibilities for each participating organization, as well as their relationship to other project participants.
2.2 Include a project schedule that includes key milestones.

3. SCIENTIFIC APPROACH

3.1 Describe the sampling and/or experimental design that will be used to generate the data needed to evaluate the projective objective(s). A description of the design should include the types and numbers of samples (including QC and reserve samples), the design of the sampling network, sample locations and frequencies, and the rationale for the design.
3.2 Identify the process measurements (e.g., flow rate, temperature) and specific target analyte(s) for each sample type.
3.3 Describe the general approach and the test conditions for each experimental phase.

4. SAMPLING PROCEDURES

4.1 Describe any known site-specific factors that may affect sampling procedures as well as all site preparation (e.g., sampling device installation, sampling port modifications, achievement of steady-state) needed prior to sampling.
4.2 Describe or reference each sampling procedure (including a list of equipment needed and the calibration of this equipment as appropriate) to be used. Include procedures for homogenizing, compositing, or splitting of samples, as applicable.
4.3 Provide a list of sample containers, sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis.
4.4 Specify sample preservation requirements (e.g., refrigeration, acidification, etc.) and holding times.
4.5 Describe the method for uniquely numbering each sample.
4.6 Describe procedures for packing and shipping samples, including procedures to avoid cross-contamination, and provisions for maintaining chain-of-custody (e.g., custody seals and records), as applicable.

5 MEASUREMENT PROCEDURES

5.1 Describe in detail or reference each process measurement or analytical method to be used. If applicable, identify modifications to EPA-approved or similarly validated methods.
5.2 If not provided in Section 5.1 or the referenced method, include specific calibration procedures, including linearity checks and initial and continuing calibration checks.

6 QUALITY METRICS (QA/QC CHECKS)

6.1 For each process measurement and analytical method, identify the required QC checks (e.g., blanks, control samples, duplicates, matrix spikes, surrogates), the frequencies for performing these checks, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met.
6.2 Any additional project-specific QA objectives (e.g., completeness, mass balance) shall be presented, including acceptance criteria.

7 DATA ANALYSIS, INTERPRETATION, AND MANAGEMENT

7.1 Identify the data reporting requirements, including data reduction procedures specific to the project and applicable calculations and equations.
7.2 Describe data validation procedures used to ensure the reporting of accurate project data.
7.3 Describe how the data will be summarized or analyzed (e.g., qualitative analysis, descriptive or inferential statistics) to meet the project objective(s).
7.3.1- If descriptive statistics are proposed, state what tables, plots, and/or statistics (e.g., mean, median, standard error, minimum and maximum values) will be used to summarize the data.
7.3.2- If an inferential method is proposed, indicate whether the method will be a hypothesis test, confidence interval, or confidence limit and describe how the method will be performed.
7.4 Describe data storage requirements for both hard copy and electronic data.

8 REPORTING

8.1 List and describe the deliverables expected from each project participant responsible for field and/or analytical activities.
8.2 Specify the expected final product(s) that will be prepared for the project (e.g., journal article, final report).

9. REFERENCES

Provide references either in the body of the text as footnotes or in a separate section.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-23

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Combustion Emissions and Expos

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Bill Linak (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-5792	
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 919-541-3670	
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates 2-3-14 (Signature) (Date)	Branch/Mail Code:	
	Phone Number: 513-487-2055	
	FAX Number:	

Scope of Work

Combustion Emissions and Exposure Support 5-23

This WA contains tasks to generate, collect, and characterize particulate matter (PM) and other pollutants from stationary combustion sources burning fossil fuels (coals, fuel oils, gasoline, petro-diesel) and biofuels (wood, glycerol, ethanol, bio-diesel). Portions of this work are being conducted in collaboration with students, post doctoral researchers, and NERL and NHEERL investigators to perform chemical characterization and exposures and collect particle and gas-phase emissions for health studies. The scope includes support activities to assemble, operate and maintain research facilities and instrumentation, as well as support data collection, health and safety, and quality assurance efforts. Task 1 describes the general efforts to generate, collection, and characterize combustion emissions from various combustion devices and fuels for use in aging and exposure studies.

The contractor shall perform the following tasks:

Task 1. Combustion Emissions – Generation, Collection, Physical and Chemical Characterization

Background

Combustion particles are ubiquitous ambient air contaminants derived from a large variety of mobile and stationary sources. Exposure to combustion PM is associated with carcinogenic and immunotoxic effects in humans and experimental animals. At the cellular level, these health effects are underlain by genotoxic and inflammatory properties of chemical compounds present in the PM. Combustion PM is composed of elemental, inorganic and organic compounds that vary widely in composition with the source of the fuel, combustor/boiler/engine operating conditions, sampling methods and other parameters. The genotoxic and inflammatory potencies of combustion PM also vary with its physicochemical properties, and these differences along with multiple health effects impede the development of targeted regulatory strategies for mitigating the impact of combustion PM exposure on human health. Combustion emissions shall be generated, and PM samples shall be collected using a number of fuels, fuel mixtures, fuel additives, combustor/boiler/engine types, operating conditions, and collection techniques. These PM samples shall then be stored and characterized through extensive chemical and physical analyses. In conjunction with the chemical and physical analyses (described above), whole particles and extracts shall be provided to NHEERL investigators for subsequent determination of inflammogenic and genotoxic potencies.

Objectives / Scope of Work

The objectives of this WA task are to generate, characterize, and collect a number of combustion emission samples with different physical, chemical, and toxicological properties, and (in conjunction with NERL and NHEERL investigators) and correlate differences in these properties with adverse health effects and mechanisms of toxicity. Experiments may include emission aging experiments utilizing a new mobile atmospheric aging chamber.

Combustion emission samples shall be analyzed for composition particle size and morphology during production while detailed chemical analysis shall be performed post-collection. Physical measurements shall include particle size distributions using a scanning mobility particle sizer (SMPS) and an aerodynamic particle sizer (APS). Particle concentrations shall be assessed with gravimetric filters and TEOM instrumentation. Particle morphology shall be examined by scanning and transmission electron microscopy. Chemical analysis shall involve qualitative analysis by aerosol time of flight mass spectroscopy (ATOF-MS), vapor phase chemistry by Fourier transform infrared (FTIR) spectroscopy, quantification of elemental and organic carbon (OC/EC), inorganic trace element analysis by x-ray fluorescence (XRF) and inductively coupled plasma-mass spectroscopy (ICPS). Additional samples shall be subjected to solvent extraction with dichloromethane (DCM), and then sequential fractionation using hexane, 50% hexane/50% DCM, DCM, and methanol to determine the relative concentrations of polar and non-polar compounds. Extract

mass shall be determined gravimetrically. Organic extracts shall be further analyzed using gas chromatography in conjunction with mass spectroscopy (GC-MS) in the full scan mode. Acquired spectra shall be searched against a computerized mass spectral library and shall also be reviewed manually. Standards of both PAHs and nitro-PAHs shall be analyzed and semi-quantitative values shall be obtained by comparing area ratios of any particular peak to the internal standard. Approximately 25 peaks shall be examined and emphasis shall be placed on those peaks that appear to differ between the samples. Since many of the more polar compounds may not be detected by the GC-MS because of their volatility, high performance liquid chromatography in conjunction with Ion Trap Mass Spectroscopy (LC-MS) shall be performed. In addition to organic analysis, PM samples may be characterized by electron paramagnetic resonance (EPR) analysis for presence and concentration of stable free radical species.

Deliverables

The contractor shall deliver raw analytical data (computer files and data sheets) and reduced data in the form of Excel spreadsheets, pie charts, and graphs of the data collected for each PM sample.

General Support

The contractor shall provide technical support, operating experience, analytical support, and expendable materials to conduct these tests using existing in-house combustion systems or through the fabrication, rental, purchase, or lending of additional combustion equipment as necessary. This support shall include:

1. The contractor shall provide expendable materials and building supplies to modify, operate, and maintain the necessary combustion equipment, dilution processing equipment, and sampling equipment as appropriate.

2. The contractor shall provide engineering and operating labor for the design and execution of test plans on these furnaces engines, and dilution systems.

3. The contractor shall maintain, calibrate, and operate monitoring equipment according to APPCD's Recommend Operating Procedures (ROPs), QAPP requirements, safety requirements, and instrument manuals.

4. The contractor shall collect and retain necessary operational data to ensure compliance with NC Air permit reporting requirements.

5. The contractor shall operate and maintain the experimental systems and air pollution control system in full compliance of NC Air permits.

Quality Assurance Project Plans (QAPPs)

The contractor shall revise or amend these QAPPs as needed in accordance with quality assurance requirements. If revisions are necessary, data acquisition shall not commence until official approval is received from EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on the "Quality Assurance Review Form" included with this extramural action.

Documentation of Technical Direction

The WAM and contractor's project manager shall schedule weekly project meeting in which task progress, issues, and future direction shall be discussed. The contractor's project manager shall summarize the notes from each of these meetings in the form of an e-mail message to the WAM. This summary shall help assure clear communication, establish project priorities, and provide documentation of technical direction.

Reports of Work

The following reports of work shall be provided.

1. Monthly progress reports with labor costs and ODC charges.

2. Health and safety plans as required by EPA safety officer.

3. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form" included with this extramural action.

4. Update Facility Manuals as required by EPA QA officer.

5. Operate Compliance reports as required by NC Air permits.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-24

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Intelligent Selection of Sampl
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:
WA 5-24: Intelligent Selection of Sampling Media for Automated Floor Sampling Devices

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Sangdon Lee	(Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4531 FAX Number:
Project Officer Name: Kevin Sudderth	(Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name:	(Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates	William Yates (Signature) 3-27-14 (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

PERFORMANCE WORK STATEMENT for Intelligent Selection of Sampling Media for Automated Floor Sampling Devices

The goal of this effort is to develop the proof-of-concept for giving Automated Floor Sampling Devices (AFSDs) the ability to identify the surface on which they are moving at any given time. A functional prototype of the surface detection/identification functionality will be produced.

One of the successful Science and Technology (S&T) projects done for the Wide Area Recovery and Resiliency Program (WARRP) was the effort to test various automated floor sampling devices (AFSDs) as remote automatic sampling devices for a wide-area anthrax incident. Several off-the-shelf units were tested, with varying degrees of success. The results from these tests are summarized in Table 1. R2 and R4 were the top-performing units in these tests.

Table 1. Results from WARRP Automated Sampling Device Project

AFSD	Model	Cleaning type	Tested Surfaces	Sampling efficiency compared to currently-used methods (%)
R1	Roomba 760	Vacuum with bristle brush	Carpet/ Laminate	26 (carpet)/8.1 (laminate)
R2	XV-11	Vacuum with silicone flat beater	Carpet/Laminate	161 (carpet)/11(laminate)
R3	P3 P4920	Vacuum (no surface agitation tool)	Carpet/Laminate	92 (carpet)/2.5 (laminate)
R4	Mint 4200	Sweep and mop	Laminate	62 (laminate)
R5	Scooba 390	Wet vacuum	Laminate	32 (laminate)

One of the suggested improvements that came from the WARRP effort was to address the issues related to the effectiveness of different types of sampling (e.g., vacuum, wipe) when the AFSD was moving over different types of floor materials. Depending on the porosity and other characteristics of the floor, one type of sampling may be preferable to another type of sampling. The ability to identify the surfaces being sampled in real-time, coupled with the ability to make decisions as to what sampling media to use at that time, would greatly improve the sampling efficiency of AFSDs. The primary motivation for doing this work is to enable the AFSD to dramatically improve its sampling efficiency without requiring any operator input.

The goal of this effort is to develop the proof-of-concept for giving the AFSDs the ability to identify the surface on which they are moving at any given time in addition to autonomously sensing the dimensions of the surrounding environment. A functional prototype of the surface detection/identification functionality will be produced. The functional specifications of the prototype will be as follows:

- Ability to detect major types of flooring materials so that sampling decisions can be made; materials to be tested will include: carpet, laminate, wood, and concrete;
- Ability to measure dimensions of the surrounding environment via remote sensing. The resulting measurements shall enable the AFSD to provide a two/three-dimensional (2D/3D) map of the sampled area.
- Small enough to be mounted on the AFSD without affecting normal operations;
- On-board battery to operate the surface detection/identification and remote sensing functionality; and
- On-board data and location acquisition system to log surface identification results for documentation purposes and later analysis.

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. The contractor shall respond to comments on the QAPP from the approval process and provide a final QAPP document. Additional information related to QA requirements can be found at www.epa.gov/quality.

The contractor shall set up the experimental test bed upon which the initial proof of concept studies will occur. The contractor shall procure equipment for generating sound and light pulses and directing them towards the surface being interrogated. The contractor shall also procure the necessary equipment capable of capturing object distance and resulting room dimensions via remote sensing (e.g., infrared light, LiDAR, etc.). The test bed shall be capable of sampling multiple surfaces, including carpet, concrete, and laminate flooring; determining sample location; and mapping the surrounding environment. The contractor shall procure equipment for acquiring the reflected sound and light pulses from the surfaces being interrogated; equipment for acquiring room measurements; and transferring the measurements to the computer data acquisition system. The LabVIEW code for processing the digital signals and location data will be developed by EPA personnel and installed onto the data acquisition system.

The contractor shall perform a series of experiments on the static test bed as per the QAPP (Task 1) to generate results of the reflected sound and light signals as a function of floor material and location being tested. The purpose of these experiments is to develop the information to train the digital signal processing (DSP) software to recognize the surface that is being interrogated. Once the DSP software has been trained, a second series of tests shall be run on the static test bed to verify the operation of the DSP software. This process may require multiple repeats before the DSP software operates acceptably. It is expected that these experiments may take approximately 12 days, two days at a time, followed by a period of data analysis and evaluation.

The contractor shall set up and perform a series of static tests as per the QAPP (Task 1) to map the surrounding environment using equipment capable of capturing object distance and room dimensions using lasers or a comparable technique. The purpose of these experiments is to demonstrate the mapping capability of the hardware/software. This process may require multiple repeats before the room mapping functionality operates acceptably. It is expected that these experiments may take approximately 12 days, two days at a time, followed by a period of data analysis and evaluation.

The contractor shall set up the experimental test bed on which these tests will occur. This will include developing materials to construct an area with multiple floor construction materials (e.g., carpet, concrete, laminate) and distinguishable setting as per the QAPP. A data acquisition/control computer shall be acquired and configured with LabVIEW software, along with any necessary LabVIEW add-on packages or 3rd party hardware necessary to perform the work. The LabVIEW software and add-on packages will be supplied by EPA. Multiple AFSDs

will be acquired for the testing as per the QAPP. It is likely that the existing stock of AFSDs from the WARRP project will be suitable for this effort.

Based on the results from Task 5, the AFSDs shall be outfitted with devices to produce the audio and/or light pulsing and remote sensing system that was used in the static test bed. The AFSDs shall also be outfitted with mobile data processing equipment to handle the DSP functionality and remote sensing developed in the static test bed. Then, based on the QAPP, a series of tests shall be performed to evaluate the performance of the DSP and mapping functionality on actual AFSDs operating over realistic flooring materials. It is expected that preparation for these experiments shall take 5 days and the experiments themselves shall take approximately 5 days.

1. Planning Meetings and Meeting Notes: The WACOR and contractor's project manager shall arrange project meetings to discuss Task-specific progress, issues, and action items. Where possible the meetings will be run via webinar.

2. Monthly Task Progress and Cost Reports: The Contractor's monthly report to EPA shall summarize work activities (accomplished and planned) in this work assignment, including the status of applicable test, QA, and safety plans. The monthly report shall also detail labor costs and ODC charges.

3. Quality Assurance Project Plans (QAPP): The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

4. Interim Report(s): The results from Tasks 2 through 6 shall be transmitted to the WACOR as one or more interim memo report(s) for internal distribution (not for external publication).

Task	Deliverable	Schedule
1	QAPP Draft	15 days after issuing WA
1	QAPP Final	15 days after receipt of review comments
2	Set Up of Static Test Bed	15 days after QAPP approval
3-4	Static Test Bed Experiments	April 2014
3	DSP Calibration Experiments	May 2014
4	Remote Sensing Calibration Experiments	May 2014
5	Set Up of AFSD Test Bed	June 2014
6	AFSD Experiments	July 2014
2-6	Final Data Report	August 30, 2014

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Fate and Transport of Radiological Dispersal Device: pressure washer application	
Description:	Decontamination of Radiological Dispersal Devices (RDD) Cs contamianted outdoor surfaces as a function of water pressure, wash duration, and deposition type using pressure washer	
Project ID:	C.2.1.1	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	IV	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Not Delivered	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-c-09-027
	Work Assignment Number:	20
	Delivery/Task Order Number:	n/a
	Modification Number:	0
	Other:	n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

N/A Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
n/a	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into al associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Sang Don Lee 2/28/2014

Sang Don Lee

- Technical Lead Person Date - QA Staff Member Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-25

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	
	Base X Option Period Number	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

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Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Worth Calfee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7600 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

STATEMENT OF WORK

DECONTAMINATION OF BUNDLED/BAGGED WASTE WITH PH-ADJUSTED BLEACH

PROJECT# HS6.03.02

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL HOMELAND SECURITY RESEARCH CENTER
DECONTAMINATION AND CONSEQUENCE MANAGEMENT DIVISION

TITLE
Decontamination of Bundled/Bagged Waste with pH-adjusted bleach

I. PERIOD OF PERFORMANCE
The period of performance for the work under this work assignment shall be April 1, 2014 through September 30, 2014.

II. SUMMARY OF OBJECTIVES
This work shall estimate the efficacy of liquid decontamination and wash-down procedures. Liquid-based decontamination approaches for on-site treatment of bundled or bagged waste items generated from an indoor office setting will also be evaluated. In addition, this effort shall evaluate the occurrence and potential reduction of viable bacterial spores (i.e., effectiveness) on vertical and horizontal surfaces as a function of wash-down procedure. Parameters such as wash down liquid, additives, pressure, flow rate, material type, and spray duration shall be evaluated for its ability to physically remove spores from surfaces. The collateral damage to materials during decontamination procedures will be monitored.

III. RELEVANCE
This project supports the mission of the Decontamination and Consequence Management Division (DCMD) within the U.S. Environmental Protection Agency's (U.S. EPA) National Homeland Security Research Center (NHSRC) by providing relevant information pertinent to the decontamination of contaminated areas resulting from an act of terrorism. The project supports the EPA's Homeland Security Research Program (HSRP) and the NHSRC's strategic goals as described in detail in the Homeland Security Research Multi-year Strategic Plan (draft, November 26, 2008). Specifically, the project is relevant to Long-Term Goal 2 (LTG-2) which states, "The Office of Solid Waste and Emergency Response (OSWER) and other clients use homeland security research program products and expertise to improve the capability to respond to terrorist attacks affecting buildings and the outdoor environments." This project addresses a direct need expressed by OSWER's CBRN Consequence Management Advisory Team (CMAT). In addition, the project is relevant to the U.S. EPA's Office of Pesticide Programs (OPP) crisis exemption process and OPP's regulatory function under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Due to the potential relevance of this project in preparing for the Federal response to wide-area anthrax incidents, this project will be managed by NHSRC with the support of a multidiscipline project team.

IV. BACKGROUND
Under Homeland Security Presidential Directive (HSPD)-10, the U.S. Department of Homeland Security (DHS) is tasked to coordinate with other appropriate Federal departments and agencies, to develop comprehensive plans which, "provide for seamless, coordinated Federal, state, local, and international responses to a biological attack." As part of these plans, the U.S. EPA, in a coordinated effort with DHS, is responsible for "developing strategies, guidelines, and plans for decontamination of persons, equipment, and facilities" to mitigate the risks of contamination following a biological weapons attack.

NHSRC provides expertise and products that can be widely used to prevent, prepare for, and recover from public health and environmental emergencies arising from terrorist threats and

incidents. Within NHSRC, DCMD's decontamination research program's goal is to provide expertise and guidance on the selection and implementation of decontamination methods and provide the scientific basis for a significant reduction in the time and cost of decontamination events. The NHSRC's research supports OSWER and OPP. OSWER, through its Special Teams which includes the CBRN CMAT, supports the emergency response functions carried out by the Regional Offices. OPP supports the decontamination effort by providing expertise on biological agent inactivation and ensuring that the use of pesticides in such efforts is done in accordance with FIFRA. Close collaboration between the different program offices having homeland security responsibilities is sought in order to rapidly increase the U.S. EPA's capabilities to help the Nation recover from a terrorist event involving the intentional release of CBR materials. Such collaborations are fostered through efforts such as PARTNER.

In 2001, the introduction of a few letters containing anthrax spores into the U.S. Postal Service system resulted in the contamination of several facilities. Although most of the facilities in which these letters were processed or received in 2001 were heavily-contaminated, they were successfully remediated with approaches such as fumigation with chlorine dioxide or VHP®. It is well agreed that additional quick, effective and economical decontamination methods having the capacity to be employed over wide areas (outdoor and indoor) are required to increase preparedness for such a release.

In addition to fumigation used in primarily, heavily-contaminated facilities, other cleaning methods were used in secondarily contaminated (e.g., cross-contaminated letters potentially in contact with the anthrax spores containing letters or tracked from primarily contaminated sites) areas or primarily contaminated facilities showing a minimal presence of anthrax spores. These methods included combinations of disposal of contaminated items, vacuuming, and the use of liquid sporicides such as a pH-adjusted bleach solution. However, waste disposal was a significant obstacle and cost during most previous anthrax clean-ups. If proven effective, a "lower-tech" approach to decontaminating bagged/bundled waste prior to disposal could reduce overall remediation costs by reducing the amount of waste treatment required off-site by specialized facilities (i.e., medical waste incinerators). Developing and demonstrating lower cost solutions to waste management could significantly increase EPA's readiness to respond to a wide area release.

Further, following a wide-area contamination incident, it has been generally accepted that responders and remediation workers will use wash-down methods to reduce the amount of residual contamination on buildings, streets, and objects (cars, park benches, vegetation, etc.). These procedures are expected to reduce the amount of contamination spread (via aerosol) to non-contaminated areas, and reduce the risk of exposure to emergency personnel and civilians after reoccupation. Currently, there are few data that describe the effectiveness of such wash-down procedures. A systematic evaluation of such wash-down methods, and identification of parameters for optimizing the effectiveness of these approaches is needed.

V. SCOPE

The purpose of this project is to determine the effectiveness of expedient decontamination procedures when applied to bagged/bundled contaminated waste. Effectiveness will be determined by sampling the waste contents following decontamination. An expedient approach, for the purpose of this effort, is defined as procedures not requiring specialized materials or

equipment (i.e., products available at a local hardware store). Additionally, an objective of this project is to determine the effectiveness of wash-down procedures at physically removing bacterial spores from common building materials (glass, concrete, etc.). The fate and transport of spores shall be determined. These two main objectives can be broken down into two Tasks. Task 1 will focus on evaluation of waste decon procedures, Task 2 shall focus on the effectiveness of wash-down procedures.

In Task 1, at least two waste decontamination approaches shall be evaluated for effectiveness. Waste materials typical of indoor office or residential environments shall be selected and included in tests. Waste shall be experimentally contaminated. A subset of waste samples (bags/bundles) shall remain untreated and serve as positive controls. Additional replicate bags/bundles shall be subjected to the decontamination treatment. Appropriate sampling strategies shall be selected, optimized, and utilized to determine the survivorship of Bacillus spores following treatment. The purpose of this task is to identify effective and efficient means to decontaminate waste in situ (i.e., on-site, not requiring hazardous transport and treatment at remote, specialized, off-site facilities)

In Task 2, at least four wash-down procedures shall be evaluated for efficacy in removing surface-bound contamination. In addition, the transport of spores in to runoff and aerosol fractions shall be determined. Subsequently, eight tests shall be conducted to determine the effect of varying spray parameters such as pressure, liquid chemistry, etc., on spore removal.

The results of both tasks shall be documented in one final report discussing efficacy as a function of independent variables and operational factors associated with each procedure. A draft report shall be provided to the U.S. EPA Work Assignment Manager (EPA WAM) for review and comment. A final report incorporating comments from the EPA WAM, and including a separate documentation of the disposition of comments, shall also be provided as the final deliverable on this work assignment. All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

VI. TECHNICAL APPROACH

The general approach that shall be used to meet the objectives of this project for both tasks is as follows, as briefly mentioned in the Section VI:

- inoculation of the materials with Bacillus atrophaeus (formerly, Bacillus globigii) spores via aerosol deposition using the procedures developed under EP-C-09-027, WA 0-25 and 1-25 (for 14 in. x 14 in. coupons, and for 4 ft. x 5 ft. coupons), and under EP-C-04-023, WA 4-3 (for 18 mm diameter coupons),
- application of prescribed decontamination methods or wash-down procedures;
- assessment of residual viable spores (via post-decontamination sampling), starting inoculation (via sampling of positive controls), and potential cross-contamination (via sampling of negative controls [blanks]);
- analysis of subsequent decontamination procedure residues (e.g., waste, waste water or air samples);

- determination of decontamination effectiveness as measured by log reduction from the test samples compared to positive control samples; and
- documentation of operational considerations (e.g., cross-contamination, procedural time, impacts on materials and personnel).

Decontamination can be defined as the process of inactivating or reducing a contaminant in or on humans, animals, plants, food, water, soil, air, areas, or items through physical, chemical, or other methods to meet a cleanup goal. In terms of the surface of a material, decontamination can be accomplished by physical removal of the contamination or via inactivation of the contaminant with antimicrobial chemicals. Physical removal could be accomplished via in situ removal of the contamination from the material or physical removal of the material itself (i.e., disposal). Similarly, inactivation of the contaminant can be done in situ or after removal of the material for ultimate disposal. During the decontamination activities following the results of the 2001 anthrax incidents, a combination of removal and in situ decontamination was used. The balance between the two was facility dependent and factored in many issues (e.g., physical state of the facility); one factor was that such remediation was unprecedented for the United States Government (USG) and no technologies had been proven for such use at the time. The cost of disposal proved to be very significant and was complicated by the nature of the waste (e.g., finding an ultimate disposal site). Since 2001, a primary focus for facility remediation has been on improving the confidence in in situ decontamination methods and evaluating waste treatment options to be able to provide information necessary to optimize the decontamination/disposal paradigm; this optimization has a very significant impact on reducing the cost of and time for the remediation effort.

All sample analysis is outside of the scope of this work assignment. Samples shall be transferred to the on-site Microbiology Lab for analysis under a separate work assignment (EP-C-09-027, WA 5-13).

VII. AFFORDABILITY

Components of this study are expected to be somewhat labor intensive; the decontamination processes, sampling, and laboratory assays will require extensive human resources. Relative to the labor costs, only a minimal amount of expendable materials are required to be purchased by the contractor for use in this effort.

VIII. TECHNICAL RISK

The technical risk involved in this project is thought to be minimal. The purpose of the effort is to provide information pertinent to the development of operational strategies for the decontamination methods included in the study. Hence, all information obtained in this project (whether intended or not) is expected to be significantly relevant to this purpose.

IX. FACILITIES AND MATERIALS

All work on this project described in this statement of work (SOW) shall be performed at the U.S. EPA's facilities located at 109 T.W. Alexander Dr., Research Triangle Park, NC. This study shall be conducted in H122A and/or H130A.

X. TASKS

Prior to initiation of the testing described in the tasks below, a quality assurance project plan (QAPP) or amendment to existing QAPPs shall be provided to EPA for review and comment. After revision based upon EPA comments (as necessary) and approval by EPA, work may commence. At least eight Category 3 or Category 4 - Applied Research QAPPs have been approved by the U.S. EPA for prior testing that have relevance to this effort:

- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 1 – Development and Evaluation of the Decontamination Procedural Steps (July 2009)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)
- Application Studies of Biological Agent Decontamination Methods (April 2008)
- Effectiveness of Physical and Chemical Cleaning and Disinfection Methods for Removing, Reducing or Inactivating Agricultural Biological Threat Agents (August 2010)
- Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 4 – Optimization of method parameters and impact of surface grime (June 2011).
- Assessment of Water Wash Down for Mitigation of Cesium Chloride Contamination PART II Pressure Washing
- Penetration of Radiological Dispersal Device (RDD) Material (CsCl and CoCl2) on Urban Building Surfaces: Effects of Serial Water Washdown
- Optimization of Water Wash down Using Simulated Firehose for RDD Decontamination

These QAPPs shall be used as the basis for the QAPP for the specific work described in this SOW. The contractor shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this work assignment package (see Attachment #1 to the SOW) and the NHSRC QA requirement as defined in Attachment #2 to the SOW. The QAPP, including any amendments, must be approved by the U.S. EPA in writing (e.g., signature on the approval page) prior to the start of any work. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

All test activities shall be fully documented during the activity via narratives in laboratory journals, the use of digital photography and video. This information shall be incorporated into the final report, as warranted to document and convey the findings of this effort. The documentation should include, but not be limited to, record of time required for each decontamination step or procedure, visual observations during the procedures, any deviations from the test plans, physical impacts on the materials, and impacts on the decontamination or sampling personnel.

The technical approach to be used throughout this study shall be developed considering the background information provided in Section V and this section. This study shall be done in two major tasks. The specific details related to these tasks are described below.

Task 1:

Evaluation of waste decontamination procedures

In this task, at least two approaches to bagged/bundled waste decontamination shall be evaluated for effectiveness at reducing the viability of Bacillus spores in common waste items. These evaluations shall occur over 6 tests. A sufficient number of test and control replicates shall be included in the test matrix.

At least three waste material combinations shall be evaluated. At least two unique combinations of decontaminant (i.e., pH-adjusted bleach and Spor-klenz) and decontaminant application (decontaminant application method, frequency, and/or flow rate) shall be evaluated. An example test matrix for Task 1 is outlined in Table 1.

Table 1: Example Task 1 Test Matrix

Test	Decontamination Approach	Material Combination
1	1	1
2	2	
3	1	2
4	2	
5	1	3
6	2	

Task 2:

Evaluation wash-down approaches for physical removal of surface biological contamination

In Task 2, the effectiveness of wash-down procedures shall be evaluated on sections of selected outdoor material types (i.e., concrete, glass, etc.). Spray parameters such as nozzle type, flow rate, application duration, additives, and spray pattern (wash down from above on vertical surfaces versus perpendicular spray-down for vertical surfaces) shall be evaluated. In addition to determining surface removal effectiveness (by determining the abundance of spores remaining on the surface after wash down), spore fate and transport into runoff liquid and aerosolization shall be determined. The potential for aerosolization of residual biologicals on the test surface after wash-down and over time (increased drying), may also be evaluated pending time and funding.

The first objective is to determine the effectiveness of (1) washing vertical surfaces from above and (2) washing vertical surfaces from the side (spray from distance). These evaluations may be

repeated for horizontal surfaces if deemed necessary. The matrix for these tests is outlined in Table 2.

Table 2.

Test	Wash-Down Approach	Material Type	Material Orientation
1	Flow from above	Glass	Vertical
		Concrete	
2	Spray from side	Glass	
		Concrete	
3*	Flow from above	Glass	Horizontal
		Concrete	
4*	Spray from side	Glass	
		Concrete	

*Optional tests, conducted at the discretion of the WAM

The second objective of this task is to evaluate the impact of various spray parameters on removal effectiveness. In addition to determining surface removal effectiveness by wash down (by determining the abundance of spores remaining on the surface after wash down), spore fate and transport into runoff liquid and aerosolization shall be determined (i.e., total balance of spores shall be determined). Wash down variables to consider during these evaluations are listed in Table 3. A series of at least 8 tests shall be conducted to evaluate these variables.

Table 3. Potential Test Variables for Bio Wash-Down

Potential Test Variables
Nozzle pressure
Flow Rate
Wash-Down Liquid (tap water, sea water, water with surfactant, etc.)
Duration of Spray
Angle of Spray
Surface Type
Surface Debris (presence, absence, type)

Additional Test Requirements:

- Wash-down liquids shall be confirmed to be free of confounding levels of background contamination prior to the initiation of each test.

- Air samples shall be taken in the decontamination chamber during the wash-down process to indicate the presence of resuspended viable spores. This samples shall be collected in accordance with the air sampling described in the approved QAPP entitled, Assessment of Liquid and Physical Decontamination Methods for Environmental Surfaces Contaminated with Bacterial Spores: Part 2 – Operational-scale Study of Full Decontamination Procedures (October 2009)."

- After the wash-down, all surfaces shall be allowed to become visibly dry before being sampled. After at least a period of one day, post-wash-down sampling shall be performed in accordance with the methods defined in the approved final QAPP.

- All equipment (e.g., brushes, storage bins, etc.) shall be properly sterilized according to the procedures defined in the QAPP prior to the initiation of each test. Proper decontamination includes selective verification of a representative number of items to be used in a test.

- After completion of each test, the chamber and all contents shall be thoroughly decontaminated with a proven procedure.

- All samples shall be transferred to the on-site Microbiology Lab in sterile primary independent packaging within sterile secondary containment containing logical groups of samples. All samples shall be accompanied by a completed chain of custody form.

- All microbiological analysis for samples described in this SOW shall be performed by the on-site Microbiology Lab. This analysis is outside of the scope of this SOW.

- All tests shall be extensively and adequately photographed and video documented to convey the test procedures.

Reporting

The contractor shall design an MS Excel data reporting sheet template prior to the start of any work that conveys all relevant information from a test under Task 1 and 2. This template shall be approved by the EPA for use, prior to conducting any testing described in this SOW. All photographs and videos shall be properly documented, indicating the exact tests in which they were taken. A log (in MS Excel) of all photographs and videos shall be maintained with the electronic files. The log shall include a description of each photograph and video, and include the test number and date. All electronic files shall be stored in a project folder set up on the EPA's DTRL share drive. All information relevant to a test (reporting sheet, digital photographs, videos, log file) shall be transmitted to the EPA WAM within 1 week from the completion of the sample analysis. This data shall have been QA/QC'd by the contractor prior to transmission. Transmission shall occur via e-mail to the EPA WAM informing him/her that the data is ready for viewing.

A data summary report detailing the test results and lessons learned from the testing shall be submitted to the EPA WAM within 30 days following the completion of the testing and no later than 8/15/2014. This report shall include documentation of the time required to complete each entire test procedure and all procedural steps. The report shall include any digital photos necessary to illustrate the findings.

XI. DELIVERABLE SCHEDULE

The deliverables previously described in this SOW with the scheduled due date are shown in Table 3.

Table 3: Deliverable Schedule

Task	Deliverable	Due Date
1,2	Draft QAPP	15 working days after initiation of this Work Assignment
1,2	Final QAPP	10 working days following receipt of EPA comments
1,2	Draft data summary report	8/15/2014

XII. REPORTING REQUIREMENTS

- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.
- All data related to this project shall be stored on the U.S. EPA servers in the DTRL share folder.
- Data transfer to the EPA WAM shall occur within one week from the completion of data analysis.
- In lieu of final reports for each or any task, journal papers within each task may be submitted at the discretion of the EPA WAM. The papers shall be authored or co-authored by the EPA WAM, at the discretion of the WAM. To serve in lieu of the final report, the journal articles must contain all of the relevant information that would have appeared in the final report.
- All products developed under this SOW (e.g., the above mentioned technical report) must conform to the requirements of EPA's Handbook for Preparing Office of Research and Development Reports (EPA/800/K-95/002). Substantive portions of this handbook can be found at www.epa.gov/nhsrc under the policy and guidance tab.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Decontamination of Bundled/Bagged Waste with pH-Adjusted Bleach
Description:	Evaluation of waste decon and surface wash-down procedures for reducing contamination
Project ID:	HS6.03.02
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	IV
Security Classification:	Unclassified
Project Type:	Sampling and Analysis
QAPP Status 1:	Not Delivered
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027 Work Assignment Number: 5-25 Delivery/Task Order Number: n/a Modification Number: n/a Other: n/a

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

No — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use

by the contractor? (QA approval must be obtained before the contractor can start work.)

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: QAPP shall be developed in accordance with attached guidlines for sampling and analysis projects
	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Worth Calfee NHSRC-DCMD Technical Lead Person	02/20/2014 Date	Eletha Roberts NHSRC-IO QA Staff Member	02/20/2014 Date

QAPP REQUIREMENTS FOR SAMPLING AND ANALYSIS PROJECTS

(from Appendix B of the NHSRC QMP)

A sampling and analysis activity or project is typically defined as a study performed to generate data to either monitor parameters on a routine basis or to characterize a particular population for later studies. The following requirements should be addressed as applicable.

SECTION 1.0. PROJECT DESCRIPTION AND ORGANIZATION

1.1 The purpose of the study shall be clearly stated in the sampling and analysis plan (SAP).

1.2 Responsibilities and points of contact for each organization shall be identified in the SAP. This should include identification of key personnel and/or organization(s) responsible for sample collection and custody, analytical and/or process measurements, data reduction, report

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-26

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Development of a vacuum-based

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

[ ] Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Sangdon Lee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4531 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Development of a Vacuum-based Biological Agent All Surface Sampler
Performance Work Statement

The contractor shall supply the personnel, equipment, and supplies to complete the tasks described below. This Work Assignment (WA) does not constitute an assignment of additional work outside the general scope of the Contract; does not constitute a change as identified in FAR clause 52.243-2 entitled "Changes" nor in any manner causes an increase or decrease in performance or changes any expressed terms, conditions of specifications of the Contract.

1.0 Title

Development of a Vacuum-based Biological Agent Surface Sampling Device

2.0 Summary of Objectives

The proposed work will evaluate options for developing a sampling device that can be used universally on porous and non-porous surface types for collection biological agents. Options for the proposed work include the development of a new surface sampling device that is vacuum-based and includes a liquid dispenser or the development of a new sampling nozzle as described above to augment a COTS device. The ultimate object is to develop a surface sampling device that can be applied to any surface type and could therefore be used in place of all existing devices and methods during the response to a biological incident. Scientifically-testing sampling methods will provide increased confidence in the ability to characterize contamination following such an event.

3.0 Relevance

The product from this work will significantly decrease surface sample collection and analysis time. Currently, there are three surface sampling devices used for biological agents including swabs, wipes, and vacuums fitted with filter-type collection media. Operationally and logistically it is challenging to prepare and utilize these three different collection methods. Furthermore, total sample collection efficiency for each of the three methods range from 12 to 40%. The new sampling device will be operationally and logistically more efficient and total sample collection efficiencies are expected to be higher than existing devices. For the swabs, wipes and vacuums; laboratory processing includes removing the biological agent from the sampling media. During this processing there are agent losses due to inefficiencies. The developed device will not require post-collection processing, as agents are captured directly into a liquid that can be analyzed. As such, the developed method will likely have higher recovery efficiencies than the existing methods. The results of this work will be made available through published reports, journal papers, and/or conference abstracts and presentations.

4.0 Technical Approach

Prototype sampling instruments or alterations to existing sampling equipment shall be made according to input from the Project Team, consisting of members of EPA's Office of Emergency Management, and EPA's Office of Research and Development. The test will determine the proper sampling liquid, liquid amount and sampling procedure. Commercially available devices or laboratory developed and modified sampling devices will be evaluated for collection efficiency through a set of

controlled tests. For example, a known quantity of Bacillus spores will be deposited by aerial dispersion onto large coupons (1 $ft.^2$ or greater), constructed of a relevant material type (i.e., carpet). The coupons will then be subjected to vacuum-based sampling, using the device of interest. Recovery will be determined for each sampling device according to culture-based microbiological assays. All test parameters, such as test chamber size, coupon materials and sizes, sampling methods, methods of extraction / analysis will be determined by agreement among participating experts mentioned previously.

5.0 Facilities and Materials

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr., unless approved otherwise by the EPA WAM. The sampling activities shall be conducted in the NHSRC's Decontamination Technologies Research Lab (DTRL) located in H-224, H-222, H-122a, and H-130a. The lab contains the necessary equipment for the tasks described herein. The analysis of the biological samples shall be conducted in the Microbiology lab, located in E-386, E-388, and E-390.

6.0 Tasks to be Performed

The contractor shall provide the personnel, equipment, materials, and supplies necessary to perform the following Work Assignment for development of a biological surface sampling device. This Work Assignment is written such that there are options in which this task can be accomplished. Test parameters shall be consulted with the EPA WAM prior to develop a QAPP.

A. Development of a Quality Assurance Project Plan (QAPP)
Project-specific details, including but not limited to number of tests, coupon materials, sampling strategies, analytical techniques, experimental controls, and coupon dosing method shall be outlined in a QAPP. The QAPP shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this IA (see Attachment #1) and the NHSRC QA requirement as defined in Attachment #1. No experimentation shall begin before this task is approved by the EPA Quality Assurance Officer (QAO) and by the CDC technical point of contact. Additional information related to QA requirements can be found at: http://www.epa.gov/quality/qs-docs/r5-final.pdf.

B. Selection of liquid sampling agent: different types of sampling liquid shall be evaluated for detaching capability of spores from different surfaces and the best performing liquid type will be determined.

C. Optimization of wet vacuum process: this task shall determine the optimal temporal lapse between liquid application and suction as a function of surface type

D. Characterization of liquid agent amount as a function of surface type: the proper liquid volume per unit surface area shall be determined for best sampling results for various surfaces.

E. Development of a Bio All Surface Sampler: the 3 to 5 types of commercial products shall be evaluated for 3 to 5 different surface types. The selection criteria shall be provided by the EPA WAM. If there is no appropriate sampler identified, then a proto-type sampler shall be developed or modified in the laboratory.

F. Data Summary Report
Following completion of all data collection, a brief report shall be prepared documenting the details of the tests, including methods, quality control measures utilized, collected data, interpreted results, and conclusions.

7.0 Deliverables

The contractor shall submit deliverables in electronic and hard copy formats. (Some deliverables are information products and may need to be formatted, or entered, as required, in online tools.) Draft and final deliverables shall be in Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Project, and/or Adobe PDF Format.

QAPP Amendment

A draft QAPP and Work Plan shall be provided by the EPA within 45 days of the award of this agreement. This shall be provided prior to commencement of the tests described within this SOW. The combined QAPP and Work Plan shall include scope, scheduling, and costing information for each of the tests planned.

Reporting

A Draft Report shall be provided by EPA for review by August 30, 2014.

8.0 Period of Performance

The period of performance for this Work Assignment is from the date of award through September 31, 2014.

9.0 Responsibilities

The experimental work and reporting under this Work Assignment is a collaborated effort between the USEPA Office of Research and Development, National Homeland Security Research Center (NHSRC), Decontamination and Consequence Management Division (DCMD) in Research Triangle Park, NC and Office of Emergency Management, Chemical, Biological, Radiological, and Nuclear Consequence Management Advisory Team. The U.S. EPA technical points of contact shall be Dr. Sang Don Lee (9199-541-4531, email lee.sangdon@epal.gov), Dr. M. Worth Calfee (phone 919-541-7600, email calfee.worth@epa.gov) and Dino Mattorano (phone 513-487-2424, email mattorano.dino@epa.gov.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Development of a Vacuum-based Biological Agent Surface Sampling Device Performance
Description:	Currently, there are three surface sampling devices used for biological agents including swabs, wipes, and vacuums fitted with filter-type collection media. Operationally and logistically it is challenging to prepare and utilize these three different collection methods. Furthermore, total sample collection efficiency for each of the three methods range from 12 to 40%. The new sampling device will be operationally and logistically more efficient and total sample collection efficiencies are expected to be higher than existing devices. For the swabs, wipes and vacuums; laboratory processing includes removing the biological agent from the sampling media. During this processing there are agent losses due to inefficiencies. The developed device will not require post-collection processing, as agents are captured directly into a liquid that can be analyzed. As such, the developed method will likely have higher recovery efficiencies than the existing methods. The results of this work will be made available through published reports, journal papers, and/or conference abstracts and presentations.
Project ID:	B.1.2.1.02
Status:	Original
Number Ammended:	
QA Category:	III
Action Type:	Extramural
Peer Review Category:	IV
Security Classification:	Unclassified
Project Type:	Applied Research
QAPP Status 1:	Not Delivered
Vehicle Status:	Existing Vehicle
Vehicle Type:	Vehicle Number: EP-C-09-027 Work Assignment Number: 4-26 Delivery/Task Order Number: N/A Modification Number: 0 Other:

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the

design, construction, and operation of environmental technologies; or development of software, models, or methods?

(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

No — Has a QAPP already been approved for the activities specified in the SOW?

Yes — Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

Provide the expected title for submission to QA staff for approval:

Development of a Vacuum-based Biological Agent Surface Sampling Device Performance

Provide the approximate date for submission to QA staff for approval:

10/31/2013

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

Not Applicable	Documentation of an organization's Quality System. QMP developed in accordance with:
Not Applicable	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
Other	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Explain: The QAPPs shall be developed in accordance with the attachment #1 (QAPP requirements for applied research projects)
N/A	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
Not Applicable	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Sign/date below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Sangdon Lee	09/17/2013	Ramona Sherman	09/17/2013

NHSRC-DCMD Technical Lead Person Date NHSRC-IO QA Staff Member Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS
(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable.

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for evaluating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified.

2.2 All QA Managers and their relationship in the organizations(*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified.

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those

procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected.

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain of custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING, DATA REDUCTION, AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided

7.6 The product document that will be prepared for the project shall be specified(*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed

8.3 The responsible party(-ies) for implementing corrective actions shall be identified

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5s-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs-r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-27

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base X Option Period Number	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Scott Moore (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-5104
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-3670
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates (Signature) 3-25-14 (Date)	Branch/Mail Code:	
	Phone Number:	513-487-2055
	FAX Number:	

SOW FY 2013-2014
Period of Performance: 04/01/2014 – 09/30/2014
Work Assignment Manager (WACOR): Scott A. Moore
Work Assignment Title: Metrology QA Laboratory Support
Contract Number: EP-C-09-027
Work Assignment Number: 5-27

Introduction

Good Quality Assurance (QA) practice requires that routine operations in a research facility be conducted according to prescribed procedures and that data be of known and adequate quality. To ensure good QA it is necessary that instrumentation be maintained in good working condition and that it be checked regularly to ensure that it produces reliable data. The Environmental Protection Agency (EPA) requires that QA practices be established and applied to all research measurement efforts. The Metrology Laboratory (Met Lab) provides QA assistance to EPA researchers by providing the procedures and the standards to calibrate various scientific devices.

I. Goal/Purpose

The objective of this Work Assignment (WA) is to provide Met Lab support to EPA researchers. The Met Lab is a facility with the capabilities to check (or audit) the calibration of EPA measurement instrumentation. A second objective is to provide support for preparing and verifying Performance Evaluation Audit (PEA) samples. The overall goal is to ensure and document that operations performed in EPA facilities produce data that will be of a known and adequate quality. This WA does not pertain to the calibration of facility devices such as smoke detectors, lights, or any health and safety related devices such as ambient Carbon Monoxide (CO) monitors that alarm strictly for safety reasons.

II. Background Information

Data Uses:
Primary users of the products of this WA will be researchers and operators of equipment in the EPA facilities. The following divisions are currently using the Met Lab services:
The Air Pollution Prevention and Control Division (APPCD)
The National Health and Environmental Effects Research Laboratory (NHEERL)
The Office of Air Quality Planning and Standards (OAQPS)
The Decontamination and Consequence Management Division (DCMD)
The National Exposure Research Laboratory (NERL)

Calibration and PEA results can be reported in research reports to support or verify findings. All Quality Assurance Project Plans (QAPP) will be the responsibility of the project lead or principle investigator of the equipment being calibrated.

Lab Site: The Met Lab is located in rooms D360-A, D362 and D364-A in EPA's Research Center in Research Triangle Park, NC.

Experience: Personnel assigned to this WA must be capable of performing the tasks listed in each of the assigned Tasks, which include electrical work, plumbing, general experience with lab equipment and materials, a familiarity with the calibration of measurement devices and a fundamental understanding of the principals behind the measurements. Lab personnel will also require the ability to reduce data and report it according to the International Organization for Standardization (ISO) "General Requirements for the Competence of Calibration and Testing Laboratories" (ISO 17025) standard and the ISO "Guide to the Expression of Uncertainty in Measurement" (GUM).

III. Shared Tasks

(1) The Met Lab was developed as a central means of providing the best practice for the calibration of laboratory equipment and at a low price by sharing those costs between various labs. The Contractor shall use their best practice in sharing the costs of equipment calibrations, repairs, system upgrades, purchases and labor hours evenly (based on volume of work) between all the Tasks 1-9 listed below.

(2) The Contractor shall obtain performance specifications on potential calibration equipment. The Contractor shall maintain and upgrade calibration systems and equipment as needed. Final decisions regarding upgrading and replacing equipment will be relayed to the Contractor in a technical directive through the WA Contracting Officer Representative (WACOR).

(3) The Contractor shall maintain Met Lab equipment in proper working order. The Contractor shall identify calibration needs and ensure that the necessary factory equipment calibrations for the Met Lab equipment are kept up to date. The Contractor shall maintain a record of all maintenance activities. Whenever practically possible, the calibration data for this equipment shall include National Institute of Standards and Technology (NIST) traceable information.

(4) The Contractor shall perform monthly Quality Assurance and/or Quality Control QA/QC checks of the X-ray Fluorescence (XRF) in Room E360. The Contractor shall assist Principle Investigators (PI) with scheduling XRF usage, sample preparation and analysis of collected samples. The Contractor will inform the WACOR of any scheduling conflicts and of any non-routine maintenance issues.

(5) The Contractor shall report the total number of hours and the total expenses incurred for all Tasks 1-9, with each monthly invoice, in this Statement of Work (SOW).

(6) The Contractor shall perform measurement device and equipment calibrations that conform to ISO 17025 and the GUM. The Contractor shall respond to calibration needs

by giving priority to projects that have time constraints. If calibrations cannot be delivered on time because multiple projects have overloaded the ability of the laboratory, the WACOR will assign project priority.

(7) The Contractor shall continue to apply the ISO 17025 standards in the operation of the Met Lab. Three factors prevent the Met Lab from acquiring the accreditation: I) The price of accreditation, II) The time needed to perform the accreditation and III) There is no practical need for the accreditation as all calibrations are internal to the EPA.

(8) The Contractor shall provide Technical Support for any Principle Investigator (PI) that may need assistance with projects that will need Met Lab support.

(9) The Contractor shall develop, document, and implement detailed calibration operating procedures for all laboratory calibration services.

(10) The Contractor shall assemble and maintain a system of published procedures and product information relevant to calibration measurement procedures and measurement devices.

(11) The Contractor shall confirm the current acceptable validation methods for all calibration systems used in the Met Lab and also for the calibration tracking system. Any confirmation of validation methods shall be documented. All database functions that are user-programmed shall be tested and the validation documented. Each revision to the database software (exclusive of the data in the database) shall have an identifiable revision number assigned to it.

IV.TASKS

Task 1 APPCD Met Lab Support.

Sub-Task A. Recertification of APPCD Analytical Balances

The Contractor shall recertify all analytical balances that are in active use and that have not been recertified within the past year. These balances have been identified in a spreadsheet that has been prepared by APPCD's QA team and that has been given to the Contractor. The Contractor shall contact the individual who has been identified as each balance's custodian to arrange for a date to recertify the balance. After each balance recertification, the Contractor shall update the spreadsheet and the Contractor shall maintain that spreadsheet a location easily accessible to all APPCD staff.

Sub-Task B. Monitoring of Temperatures of APPCD Refrigerators and Freezers

APPCD has purchased HOBO® temperature data loggers to monitor the temperatures of APPCD refrigerators and freezers. The Contractor shall verify the calibration of the data loggers on a yearly basis. After the verification, the Contractor shall deploy the data

loggers in APPCD refrigerators and freezers. Thrice-yearly the Contractor shall download temperature data from the data loggers, replace batteries if necessary and post the downloaded data in a location easily accessible to all APPCD staff.

Sub-Task C. Weights, Flows, Temperature and Relative Humidity (RH) Calibration Support

The Contractor shall calibrate/verify Weight sets, Flow devices, Temperature devices and RH Meters for APPCD Labs. The total number of APPCD devices is difficult to calculate due to instruments that are purchased, excessed or moved based on project activity. The Contractor shall use their best practice to accommodate as many of the calibrations as possible and inform the WACOR of any difficulties that may arise.

Task 2. NHEERL Met Lab Support.

Sub-Task A. NHEERL Calibration of Analytical Equipment

The Contractor shall perform measurement device and equipment calibrations that conform to the NHEERL Calibration SOPs or ISO 17025 and the GUM. Some of these devices will be carried to the Met Lab for calibration. Other devices cannot be physically carried to the Met Lab facility, therefore the Contractor will need to take portable calibration equipment to the NHEERL Lab to perform the calibration. The Contractor shall maintain a record and data base of all equipment calibrations and calibration schedules. The following devices from NHEERL will be calibrated by the Met Lab:

354	balances
24	plate readers
74	pH meters
2	luminometers
26	spectrometers
7	Thermometers
30	mass sets
2000	pipettes

Sub-Task B. NHEERL Additional Calibration and Repairs.

The Contractor shall calibrate other devices not on this list as labor hours will allow. There may be circumstances where the calibration (or repair) of an instrument is beyond the technical expertise of the Met Lab. If this occurs, the Contractor shall make the arrangements with the instrument vender to have the instrument repaired and /or recalibrated. The Contractor shall communicate with the WACOR the status of that instrument throughout that process.

Task 3.- NHEERL Inhalation Toxicology Facilities Branch (ITFB) Met Lab Support

Sub-Task A. ITFB Calibration of Analytical Equipment

The Contractor shall perform equipment calibrations to the following list of devises:
a) 37 Flow devices
b) 11 Relative Humidity Probes
c) 3 Pressure devices
d) 4 Ozone Analyzers
e) Any other devise as needed

Sub-Task B. ITFB Additional Calibration and Repairs.

The Contractor shall calibrate other devices not on this list as labor hours will allow. There may be circumstances where the calibration (or repair) of an instrument is beyond the technical expertise of the Met Lab. If this occurs, the Contractor shall make the arrangements with the instrument vender to have the instrument repaired and /or recalibrated. The Contractor shall communicate with the WACOR the status of that instrument throughout that process.

Task 4.- NHEERL Mid-Continent Ecology Division (MED) Met Lab Support

The Contractor shall select a Designated Specialist (DS) for pipette calibrations that conform to the NHEERL-MED Calibration SOPs or ISO 17025 and the GUM. These devices shall be calibrated on site or mailed to the DS. NHEERL-MED will pack and mail (via any carrier at the discretion of NHEERL-MED) all of the devices (i.e. pipettes) to be calibrated to the DS. NHEERL-MED will be responsible for all shipping charges. The Contractor shall maintain a record and data base of all equipment calibrations and calibration schedules. NHEERL-MED will have 600 pipettes be calibrated via the Met Lab. NHEERL-MED would like to maintain a schedule of calibrating 150 pipettes (or ¼ of their total volume) every 3 months.

Task 5.- DCMD Met Lab Support

The Contractor shall calibrate/verify Weight sets, Flow devices, Temperature devices and RH Meters for DCMD Labs. The number of devices is difficult to calculate due to new instrument purchases, excessed equipment and devices that are used sporadically. The Contractor shall use their best practice to accommodate as many of the calibrations as possible and inform the WACOR of any difficulties that may arise.

Task 6. OAQPS Met Lab Support

The Contractor shall calibrate the following devices that are used as Performance Evaluation Procedure (PEP) verification/calibration equipment:
30 BGI DeltaCal
23 BGI TriCal devices
23 BGI High Volume Calibrators
10 BGI tetraCal devices
1 Druck device
1 temperature probe readout

Temperature, pressure and flow calibrations shall be calibrated with equipment that is traceable to the National Institute of Standards and Technology (NIST).

Calibrations confirm the manufacturers claim for accuracy and repeatability and shall be accomplished on an annual basis. The equipment will be delivered to the Met Lab, Building D, Room D362, of the Main Campus of the EPA in RTP by the Contact Person (this may be an EPA PI, an EPA WACOR of another project or a technician in charge of the equipment listed above). The devices will arrive in six separate batches throughout the each year. For each batch the events shall occur in the following order:

	Event
1	The Met Lab will be notified of the number of standards expect to ship and of the delivery date by the Contact Person.
2	The Contact Person will deliver the BGI DeltaCal and/or BGI TriCal and/or High Volume devices to the Met Lab in RTP.
3	The Met Lab will perform the PEP verification/calibration that applies to each of the devices and provide the temperature, pressure and flow calibration's documentation that shows traceability to the NIST.
4	The Met Lab will notify the Contact person when the calibrations are completed and inform the Contact Person when they can pick up the devices from the Met Lab in the RTP.

Task 7. Standard Reference Photometer (SRP) Ozone Support

(1) The Contractor shall receive an Ozone measuring devise and unpack the equipment to be set it up to run against EPA's Primary Standard Reference Photometer serial number 01 (SRP-01). The designated Lab is D360-A.

(2) The Contractor shall break down an Ozone measuring devise in preparation for shipping it back to the specific owner

(3) The Contractor shall perform minor repairs on the SRPs as per Technical Directives from the WACOR.

(5) The Contractor shall become familiar with the Draft SOP for the SRP (provided by the WACOR) and also the Draft: Transfer Standards for Calibration of Air Monitoring Analyzers for Ozone (PDF) (67pp, 820 KB) - May 31, 2009 as found on the website: http://www.epa.gov/ttn/amtic/srpqa.html

(6) The Contractor shall maintain the Zero Air Supply used for the Ozone Lab.

(7) The Contractor shall maintain a calibration schedule for various support instrumentation such as the Barometric Pressure Sensor, the STOLAB Temperature calibrator and the Fluke Digital Volt Meter.

(8) The Contractor shall perform QA evaluations using Excel and Word templates provided with the SRP Software.

(9) The Contractor shall provide the WACOR with any calibration that is performed for final approval and before it is released to any other entity.

(10) The WACOR shall be copied on all correspondence to and from any laboratories and venders used in the completion of the tasks associated with the projects. Any documents or literature during any of these correspondences will also be made available to the WACOR.

(11) The Contractor shall be responsible for the annual re-verification of SRP-01, which is performed by NIST. In the past this function was handled by an Interagency Agreement (IA). However, due to issues that NIST has experienced with various legal issues, they are now refusing to honor any IA. The contract office is not able to issue a purchase request to another government agency and the cost is more than what can be put on a government credit card. The only available vehicle to get this instrument re-verified now is through the Contractor. The WACOR will issue a TD concerning details of the re-verification of SRP-01.

Task 8.- Duke Forest Site Support

Duke Forest is a remote location near Chapel Hill, NC where EPA is continuing research. The Contractor shall provide support for this location by providing calibrations and/or repairs to the sampling equipment, this includes equipment in Lab E584 that will be deployed at Duke Forest Site and Duke Forest site modifications. Specific details shall be detailed in Technical Directives from the WACOR.

IV. Deliverables (Applies to all Tasks and Sub-Tasks)

The Contractor shall provide the following reports for APPCD:

(1) Monthly reports of the laboratory support activities including the following:

a) The number of and type of calibrations performed.
b) Any costs incurred during calibration activities.
c) Any maintenance activities performed.
d) Any documentation activities performed.
e) Status of the Facility Manuals.
f) Any other activities that would impact the operation of the Met Lab.

(2) Special reports as requested via a Technical Directive by the WACOR.

(3) The Contractor shall respond to calibration needs by giving priority to projects that have time constraints. If calibrations cannot be delivered on time because multiple projects have overloaded the ability of the laboratory, the WACOR shall be notified and then provide technical direction to the Contractor for prioritization.

(4) The WACOR shall be copied on all correspondence to and from any laboratories and venders used in the completion of the tasks associated with the projects. Any documents or literature during any of these correspondences will also be made available to the WACOR.

(5) The Contractor shall provide a Calibration Certificate for each device and give it to the Principle Investigator (PI) or to the Contractor Task Lead and keep a copy (either hard copy or electronic) on record.

(6) Formatting of reports shall be consistent with historical reporting and electronic files shall be compatible with Agency Standard Software. During EPA Fiscal Year 2014 (FY14), federal employees and Contractors will be upgraded to Windows 7 and Adobe Reader 10. Federal employees will be upgraded to Office 2013 during FY13. Hard copies of reports are acceptable; however, electronic copies are encouraged.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-31

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	
	Base X Option Period Number	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Michael Hays	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-3984
	FAX Number:
Project Officer Name: Kevin Sudderth	Branch/Mail Code:
(Signature) (Date)	Phone Number: 919-541-3670
	FAX Number:
Other Agency Official Name:	Branch/Mail Code:
(Signature) (Date)	Phone Number:
	FAX Number:
Contracting Official Name: William Yates	Branch/Mail Code:
William Yates 4-3-14	Phone Number: 513-487-2055
(Signature) (Date)	FAX Number:

Statement of Work 5-31

I. **Title:** Analytical laboratory support for the physical and chemical characterization of organic gases and PM2.5

II. **Background:** The Air Pollution Prevention and Control Division's (APPCD) Emissions Characterization and Prevention Branch (ECPB) conducts research on fine particulate matter (PM2.5) and aerosol emissions as they pertain to the implementation of the National Ambient Air Quality Standards (NAAQS). Measurement of the physical and chemical properties of both gas- and particle-phase emissions is a research priority for ECPB. These measurements are used as input to National emissions inventories and to establish global air quality trends and to understand related public health effects. Chemical source profiles are also used in source-receptor models that apportion ambient gases and PM2.5 to various anthropogenic and natural emissions sources. NRMRL-ECPB aims to characterize gas- and particle-phase source emissions and to develop and evaluate methods to measure and prevent these emissions. This Work Assignment seeks to update and upgrade source emissions profiles and PM2.5 mass emissions factors while improving the quality of data used for dispersion and source-receptor modeling and for evaluating current risk management and regulatory strategies.

In sum, the objectives of this project are to physically and chemically characterize source-related gas and PM2.5 samples for: (i) improving chemical source profiles; (ii) accurately apportioning ambient organic matter; (iii) improving fine PM mass and individual gas and PM component emission factors; and for (iv) supporting health and toxicological research.

III. **Work Assignment Objective:** The objective is to provide the Fine PM Characterization Laboratory (FPMCL) technical support for the chemical characterization of PM2.5 filter samples collected from a variety of important sources, especially, but not exclusively, combustion sources. Support for semi-volatile organic compounds (SVOCs) and gas-phase samples collected on polyurethane foam plugs (PUFs), SUMA canisters, and similar sampling media or devices shall also be provided. The contractor shall be responsible for the characterization of (1) gas- and particle-phase emissions from residential- and industrial-scale boilers and (2) samples from emissions tests conducted with jet engines and with vehicles or generators burning diesel, bio-diesel, and ethanol-gas fuel blends. Characterization of near-source samples including those collected near roadways, biomass burning, industrial or commercial activities or similar polluted environments shall be necessary. Before analysis of any sample set the contractor shall seek the technical direction of the WA task manager. In some cases, the WA task manager will direct the contractor to provide samples to other authorized laboratory personnel for specialized sample analysis. An additional objective shall be to provide the WA task manager with a written report on a monthly basis or upon completion of the chemical and physical characterization of an emissions source.

IV. **Scope-of-Work:** In fulfillment of the objectives of this Work Assignment, the following Tasks listed below shall be performed by the Contractor, and throughout the course of performing these Tasks, the Contractor shall comply with (1) the FPMCL Quality Assurance Project Plan (QAPP) entitled Chemical Analysis of Fine Particulate Matter, Revision #9, dated April 2012, (2) all its addendums and (3) the FPMCL Facility Manual. All work will be conducted using these existing documents. Moreover, the contractor shall follow all issued standard operating procedure (SOP), chemical hygiene, and Laboratory related health and safety plans.

V. In accordance with laboratory protocols established by the EPA for analysis of volatile and semi-volatile organic gases and PM2.5 samples, the contractor shall acquire laboratory supplies and consumables needed to accomplish the technical laboratory support work described below. The analytical protocols will be provided to the Contractor by the EPA Work Assignment Manager prior to initiation of the technical work.

A. The contractor shall determine the purity of each new lot of extraction solvents and, as necessary, purify any solvents that may be contaminated by commercial practices. The solvents shall be of sufficient purity to enable extraction and analysis of the samples and shall not contain interfering contaminants that may detract from the Data Quality Objectives of the project. The Data Quality Objectives are specified in the project QAPPs as stated above. The purity of the solvent shall be documented by the contractor and identification of the solvent lot used for sample extraction shall be reported by the contractor. The contractor shall include this information in the monthly written progress reports. Or this information shall be contained in the final report written for each source following the completion of its characterization.

B. The contractor shall clean substrates, sampling train components, and sample containers for collection of gases, liquids, and PM2.5, for field deployment, or for in-house sampling campaigns. Sample substrates and blanks may include Teflon membrane and quartz fiber filters, XAD-coated annular denuders, aluminum foil, XAD impregnated quartz filters, glass beads, PUF (polyurethane foam plugs) and various SUMA canisters. Also, the contractor shall provide clean glassware for use in the analyses of the PM samples. Decontamination methods will involve various solvent rinses and/or high temperature thermal removal of contaminants as described in the facility manual.

C. The contractor shall condition and weigh Teflon filters and Al foil substrates before and after PM sample collection in accordance with established EPA weighing procedures and quality control.

D. The contractor shall maintain a sample custody log of samples submitted for analysis following sample collection. For the vast majority of cases, it shall be necessary for a number of individual samples from a single source to be composited, thereby requiring careful recording of the composited samples. Before samples are composited, the contractor shall notify the WAM of the intention to do so. The WAM will also notify the contractor of the analytical method to be applied prior to analyzing any sample set.

E. Using protocols established and supplied by the EPA Work Assignment Manager, the contractor shall perform solvent or thermal extractions of particulate matter and semi-volatile organic matter samples collected on various media substrates. Samples shall be prepared so that analyte concentrations are appropriate for precise and accurate quantitative analysis of individual trace organic compounds and major inorganic ions. Once the individual species are identified and quantified in the PM mixture, the contractor shall report the raw and processed data and appropriate proof of the data quality to the WAM. The contractor shall also be responsible for running library searches on chromatographic data for the tentative identification of organic molecules in the PM extracts. The results of each search shall be reported by the contractor and compared against an appropriate blank to ensure validity. For quantified compounds, the contractor shall report whether (1) standards were available, (2) the compounds were within the calibration range, (3) the quantified compounds were above or below minimum detectable or quantifiable levels, and (4) the type of model used to fit calibration data. The contractor shall perform an identical set of functions for the gas-phase pre-concentration system used to analyze volatile organic compounds (VOCs), many of which are hazardous air pollutants.

F. Following a procedure established and provided by the EPA Work Assignment Manager, the contractor shall perform derivatization of polar organic compounds that enables quantitative resolution of such compounds via gas chromatography/mass spectrometry. Suitable standards shall also be derivatized by the contractor and used to (1) estimate deuterated standard recoveries (by making multiple GC/MS runs of the deuterated standards during a sample run sequence) and (2) to populate appropriate calibration database levels. Documentation of data quality for the derivatization steps shall be performed by the contractor. This data quality documentation shall be linked to specific PM extract samples analyzed by GC/MS. The contractor shall purchase derivatization equipment needed to conduct *on-line* or *in-situ* methylation and silyatoin experiments. Purchased equipment shall be compatible with the GC-MS technology and instrumentation available in the FPMCL and shall include an auto-sampler device.

G. The contractor shall provide for appropriate handling and disposal of all laboratory waste solvents and other laboratory waste materials.

H. The contractor shall operate, maintain, and modify, as necessary, analytical instrumentation and ancillary equipment in the EPA FPMCL. (Note: this Task includes ensuring appropriate instrument gases are provided (e.g., He, H_2, N_2, and air). The contractor shall maintain a file of operating manuals for all equipment and instruments. Equipment and instruments included in this Task are:

- HP-7890/7000 Auto sampler/Gas Chromatograph/MSD (qqq) in Room E580-A
- HP-6890/5793 Thermal extraction unit/Gas Chromatograph/MSD/FID in E580-A
- HP-6890/5793 Thermal extraction unit/2-dimensional Gas Chromatograph/MSD/ in E589-A
- HP-6890/5793 VOC pre-concentrator (ENTECH Inc) Gas Chromatograph/MSD/ in E288
- HPLC-MS (Q-TOF) and N_2-generator in E589
- Zymark TurboVap solvent concentrator in E580-A
- Cryofreezer in E580
- Fisher Isotemp muffle furnance in E569
- Skutt ceramic kiln in E578-A
- Nuaire horizontal clean bench in E578-A
- Sunset Thermal-Optical Elemental/Organic Carbon Analyzers in E-581-A and E589
- Thelco convection oven in E581-A
- Ainsworth semi-micro balance in E581-A or high-bay area
- Dionex 120 ion chromatograph in E581-A
- Sartorius MC5 microbalance in E580-A
- Cahn ultra microbalance in E580-A
- Terra Universal modular clean room in E580-A
- Dracor water purification system in E581-A
- Frigidaire commercial freezer and additional cryo-freezer units in E578
- Domnic-Hunter hydrogen generators (2) in E581-A

L. The contractor shall maintain a complete and up-to-date chemical inventory for the FPMCL Facility along with Material Safety Data Sheets for all chemicals.

M. The contractor shall update, as needed, the Facility Manual for the PM2.5 Analytical Facility which includes as a minimum the following items:

- General facility lay-out
- List of equipment by name, serial and model no, custodial account ID, EPA decal no., and location
- Computer software and hardware
- Safety/Health protocols
- Quality Assurance and Control protocols
- Sampling and Analysis Methods (ASTM, EPA, Miscellaneous Operating Procedures)

N. With the exception of the miscellaneous operating procedures (MOPs) for cleaning sample substrates, laboratory glassware, and sampling train components for which the Contractor shall be responsible, the QA/QC protocols, analytical protocols, and other MOPs will be provided by the EPA Work Assignment Manager for incorporation into the Facility Manual. The Facility Manual is a working document and will incorporate new material as protocols are established or modified and additional equipment is acquired.

O. The contractor shall supply to the WAM on a monthly basis a written progress report that includes: (1) a list by identification number of the samples analyzed; (2) the type of analysis done; (3) the results and data analysis; (4) an interpretation of the meaning of the results; (5) future work planned in the laboratory; (6) proof of data quality; (7) description of experimental procedure used and any observed anomalous behavior; and (8) description of laboratory operations; The contractor shall also provide to the WAM electronic copies of completed data sets and data analysis by source. In the event that the analysis of sample substrates from a single test source are completed, the contractor shall produce a written report describing the results of the analysis, the source sampling test conditions, and any other pertinent particle sizing and/or counting data.

VI. Labor mix: To achieve the objectives of the WA the following labor mix is required: (1) a person with extensive experience in chemical analysis using chromatography (GC-MS/FID, LC-MS, etc.). This individual shall have at least 15 years of GC-MS experience and be familiar with the extraction and pre-concentration procedures used for PM and miscellaneous organic gases. This individual shall be responsible for GC-MS (qqq) analysis and interpretation of GC-MS data as stated above. This person shall be capable of following all the required QA/QC procedures established in the QA protocol and shall be required to communicate results to the WA task manager. This individual shall also be responsible for certain research pursuits as they relate to the analysis of GC-MS data, including library searches and the application of identified deconvolution algorithms. The contractor shall ultimately be responsible for all of the GC-MS data quality provided to the WA task manager. (2) an individual who assists with extractions, sampling and media pretreatment and sample handling, and other similar logistical tasks shall occasionally be needed.

VII. Equipment purchase: The contractor shall look into the possibility of further automating the micro-solvent extraction, filtering, and concentration techniques. In consultation with the WAM, the contractor shall purchase technology that improves the analytical sample throughput or speed at which these steps can be conducted. Additional sampling equipment shall also be purchased in the event there is a need to complete a project in a timely manner.

VIII. Deliverables: The contractor shall deliver: (1) a data report containing the final sampling and chemical results from testing of aerosols and (PUF) gases emitted from a series of dynamometer tests conducted with multiple fuel blends including biodiesel (due on or before August 15, 2014); (2) a finished data spreadsheet and analytical description that includes the composition of organic particles and gases emitted from prescribed fires and peat combustion experiments performed in the field and in an on-site burn hut (due on or before September 1, 2014); (3) a spreadsheet with concentration values of polycyclic aromatic hydrocarbons emitted from ethanol vehicles tested with an EPA-OTAQ toxics sampler (due on or before May 1, 2014); (4) Evidence of extraction method development for SVOC and PM matrixes captured using a novel 3-stage cryo-sample collection unit developed in collaboration with NHEERL (August 31, 2014).

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-38

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Chamber Decontamination Studie
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee:	LOE:
Contract Period: 04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

	Cost/Fee:	LOE:
Contractor WP Dated:		
Cumulative Approved:		

Work Assignment Manager Name: Joe Wood (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-5029 FAX Number: 919-541-0496
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates (Signature) 3-25-14 (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

STATEMENT OF WORK

Chamber Decontamination Studies Using Mock Office Setup

OMIS DCMD
APPCD ON-SITE CONTRACT EP-C-09-027

I. PERIOD OF PERFORMANCE

The period of performance for this work assignment (WA) shall be from April 1, 2014 to September 31, 2014.

II. SUMMARY OF OBJECTIVES

This work will involve evaluating the sporicidal efficacy of hydrogen peroxide vapor (HPV) utilizing a mock office set up in the COnsequence ManageMent ANd Decontamination Evaluation Room (COMMANDER) chamber located in H130. Tests will be conducted utilizing bacterial spores (such as Bacillus atrophaeus or Geobacillus stearothermophilus, surrogates for Bacillus anthracis) aerosolized into COMMANDER. A report shall be drafted of the methods and results.

III. BACKGROUND

Work will build upon (but not duplicate) tests conducted under 4-38, although with the use of HPV in lieu of chlorine dioxide. Hydrogen peroxide vapor will be disseminated through the use of either the Steris VHP® unit and/or the dry fogger used in previous WA under this contract.

IV. TECHNICAL APPROACH

In COMMANDER, decontamination efficacy will be determined based on inactivation of bacterial spores disseminated into the chamber. Lastly, this work assignment covers only the efforts related to conducting the decontamination tests. All microbiological preparation and analyses work will be conducted by the on-site Biolab under a separate work assignment on this same contract.

V. AFFORDABILITY

This effort is labor intensive, which is where the bulk of the funding is required. Normal expendable laboratory items are also required for this project.

VI. FACILITIES AND MATERIALS

All tasks described in this SOW shall be performed in-house, at the EPA's Research Triangle Park (RTP) facilities at 109 T.W. Alexander Dr.

VII. TASKS

No work conducted under this WA shall duplicate work conducted under previous work assignments, unless directed by the WA manager (WAM), and in order to troubleshoot problems from previous work and to assess repeatability (precision) of the data gathered previously. All microbiological preparation and analyses work will be conducted by the on-site Biolab under a separate work assignment on this same contract.

The Contractor shall perform the following tasks:

1. Prepare an amendment(s) to the existing quality assurance/test plan (QATP), which shall cover the experiments as described in Task 2 of this SOW. The QATP amendment shall be in agreement with the requirements set forth in the Quality Assurance Requirement Form (QARF) and as delineated in "Attachment #1". To the extent feasible, the QATP shall be consistent with and based upon existing QATPs, developed under other similar work assignments from previous or current APPCD contracts.

2. Conduct up to 7 experiments in COMMANDER utilizing HPV. Tests will determine the log reduction in viable bacterial spores aerosolized into COMMANDER using a mock office set up.

3. Provide general support for maintaining the lab equipment. This support shall include assembly, maintenance, troubleshooting, and configuration support for the any equipment used for testing. Support shall also include the purchase of any expendable materials, with prior approval from the WAM, for use in this project.

4. Report the results of all tests, including data received from the Biolab (work conducted under the Biolab WA, in support of this WA) to the WAM as soon as possible via email and through the use of the DTRL share drive. The WAM shall be notified immediately of any problems encountered in the laboratory or with the results obtained. These data shall include any generated data files (i.e., logged data) properly annotated, reports of the experimental conditions, calibration checks, measured variables, and a listing of the samples awaiting further analysis.

5. Analyze the data per the requirements in the QATP and in consultation with the WAM, and report the results of these analyses as soon as possible via email and through the use of the DTRL share drive. The expected data analyses would be in the form of Excel spreadsheets or other appropriate software.

6. Meet with the WAM at least every week to provide a project status update. The update shall include a synopsis of activities taking place the past week, problems encountered, and work planned for the next week.

7. Update the health and safety research protocols, as needed, as required by the EPA Facility and APPCD safety personnel. Updates to these protocols shall be approved by the EPA WAM and safety personnel prior to the commencement of any testing. The contractor shall provide a copy of the health and safety plan to the WAM and the ORD-Safety Office for discussion.

8. Prepare monthly reports to EPA that summarize work activities (accomplished and planned) in this work assignment, including the status of applicable test, QA, and safety plans. The monthly report shall also detail labor costs and ODC charges. The ODC charges shall be documented in the report in a way that the items purchased, vendor, and

cost are clearly indicated.

VIII. DELIVERABLE SCHEDULE

The following table outlines the expected schedule that the contractor shall meet for the period covered by this SOW. The schedule assumes a start date of April 1, 2013. Dates dependent upon completion of specific tasks shall be updated based on discussions between the contractor WAL and EPA WAM during the development of the test plans to cover the work specified herein.

Suggested Deliverable Schedule

Deliverable	**Completion Date**
Submit work assignment plan	4/15/14
Submit first draft of test/QA Plan amendment	4/21/14
Revise test/QA Plan amendment per WAM comments	2 weeks after comments received
Complete Task 2	9/31/14
Complete other tasks	ongoing

IX. REPORTING REQUIREMENTS

- The Contractor shall prepare a brief memorandum to the WAM which discusses how well various measurements described in the QA plan were met.

- The monthly invoice reports for this work assignment shall provide a detailed description of any equipment or expendables that have been purchased by the contractor for use on the projects discussed herein.

- All data and analyses worksheets generated as discussed in Section VII. shall be provided in electronic format in Excel and/or other appropriate software, in consultation with the WAM.

X. QUALITY ASSURANCE

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action, see attachment #1 and #2. The contractor shall prepare a QAPP in accordance with http://www.epa.gov/quality/qs-docs/r5-final.pdf or based on the type of research that is being conducted. For guidance on preparing a research-specific QAPP, the preparer should refer to the project specific requirements provided in NHSRC's QMP. The QAPP must be approved prior to the start of any laboratory work. Additional information related to QA requirements can be found at www.epa.gov/quality.

NHSRC QUALITY ASSURANCE REQUIREMENTS FORM
Attachment 1 to the Statement of Work

I GENERAL INFORMATION

Title:	Chamber Decontamination Studies Using Mock Office Setup	
Description:	This is a follow on Arcadis WA but using hydrogen peroxide vapor	
Project ID:	HS6.02.01	
Status:	Original	
Number Ammended:		
QA Category:	III	
Action Type:	Extramural	
Peer Review Category:	III	
Security Classification:	Unclassified	
Project Type:	Applied Research	
QAPP Status 1:	Existing QAPP	
Vehicle Status:	Existing Vehicle	
Vehicle Type:	Vehicle Number:	EP-C-09-027
	Work Assignment Number:	5-38
	Delivery/Task Order Number:	N/A
	Modification Number:	N/A
	Other:	N/A

*If you are processing an **IAG** or **CRADA**, the responsibility for QA must be negotiated within the agreement. The TLPs in consultation with the QAMs in the various organizations must agree on, and document, which organization will take the lead for QA, the names of the QAM and TLP from each organization, and the QA requirements that will be adhered to during the agreement. Include this info in the IAG/CRADA package.*

II SCOPE OF WORK

Yes — Does the Statement of Work contain the appropriate QA language?

The awardee shall comply with all requirements as delineated on the "Quality Assurance Planning Requirements Form (QARF)" included with this extramural action. The contractor shall prepare a QAPP in accordance with the R-2 and R-5 and/or the attachments provided with the SOW. The QAPP must be approved prior to the start of any work. Additional information related to QA requirements can be found at http://www.epa.gov/quality/qs-docs/r5-final.pdf

Yes — Does this extramural action involve the collection, generation, use, and/or reporting of environmental data; the design, construction, and operation of environmental technologies; or development of software, models, or methods?
(If "No" then skip to Section IV, and sign the form.)

No — Will the SOW or any subsequent work assignments or task orders involve any cross-organizational efforts within EPA?

Yes — Has a QAPP already been approved for the activities specified in the SOW?

Provide the title, date or revision number, and date of QA approval:
Chamber Decontamination Studies with Chlorine Dioxide Gas and Fogging Technology

Does the QAPP require *any* revision by the contractor**

yes, an amendment will be produced

No Is an applicable QAPP in the process of being prepared, revised, or approved by EPA personnel for future use by the contractor? (QA approval must be obtained before the contractor can start work.)

*** The term "contractor" applies loosely here, such that as applicable, this term can also mean "awardee", "cooperator" and/or "grantee". Likewise, the term "contract" includes "agreements" and other vehicles. ?*

III QA DOCUMENTATION OPTIONS

All documentation specified under "Other" must be defined in the NHSRC Quality Management Plan and be consistent with requirements defined in EPA Manual 5360 A1. For all items checked below, there must be adequate information in the SOW (or its appendices) for the offeror to develop this documentation. Where applicable, reference a specific section of the SOW. *(R-2 refers to EPA Requirements for Quality Management Plans (QA/R-2) (EPA/240/B-01/002, 03/20/01) and R-5 refers to EPA Requirements for Quality Assurance Project Plans (QA/R-5) (EPA/240/B-01/003, 03/20/01). Copies of these documents are available at http://www.epa.gov/quality/qa_docs.html.)*

After Award Documentation

R2	Documentation of an organization's Quality System. QMP developed in accordance with:
R2 and R5	Combined documentation of an organization's Quality System and application of QA and QC to the single project covered by the contract: Developed in accordance with:
R5	Documentation of the application of QA and QC activities to applicable project(s). Developed in accordance with:
	Programmatic QA Project Plan with supplements for each specific project, developed in accordance with:
	Existing documentation of the application of QA and QC activities will be used:

IV SIGNATURE BLOCK

The signatures below verify that the Statement of Work (SOW) has been reviewed to ascertain the necessary QA and QC activities required to comply with EPA Order 5360.1 A2, that the COR understands these requirements, and that the COR will ensure that the quality requirements indicated on the previous pages of this form are incorporated into all associated SOWs. *(Signature below, obtain a concurrence signature from the QA Staff, and submit the form along with the other extramural action documentation.)*

Joe Wood NHSRC-DCMD Technical Lead Person	03/03/2014 Date	Eletha Roberts NHSRC-DCMD QA Staff Member	03/03/2014 Date

QAPP REQUIREMENTS FOR APPLIED RESEARCH PROJECTS

(from Appendix B of the NHSRC QMP)

An applied research project is a study to demonstrate the performance of technologies under defined conditions. These studies are often pilot- or field-scale. The following requirements should be addressed as applicable

SECTION 0.0, APPROVAL BY PROJECT PARTICIPANTS

The EPA Technical Lead Person (TLP) shall be responsible for obtaining signatures of appropriate project participants on the signature page of the QA plan, documenting agreement to project objectives and the approach for eva uating these objectives.

A distribution list shall be provided to facilitate the distribution of the most recent current version of the QAPP to all the principal project participants.

SECTION 1.0, PROJECT DESCRIPTION AND OBJECTIVES

1.1 The purpose of study shall be clearly stated.

1.2 The process, site, facility, and/or environmental system to be tested shall be described.

1.3 Project objectives shall be clearly stated and identified as primary or non-primary.

SECTION 2.0, PROJECT ORGANIZATION

2.1 Key points of contact for each organization involved in the project shall be identified

2.2 All QA Managers and their relationship in the organizations (*i.e.*, location within each organization) shall be identified with evidence that the QA Manager is independent of project management.

2.3 Responsibilities of all other project participants and their relationship to other project participants shall be identified meaning that organizations responsible for planning, coordination, sample collection, sample custody, measurements (*i.e.*, analytical, physical, and process), data reduction, data validation, and report preparation shall be clearly identified

SECTION 3.0, EXPERIMENTAL APPROACH

3.1 The general approach and the test conditions for each experimental phase shall be provided. The statistical methods that will be used to evaluate the data (*i.e.*, ANOVA, or summary statistics) should be identified.

(NOTE: As deemed appropriate to the project by the TLP, the information requested in Sections 3.2, 3.3, and 3.4 may be presented here or in Section 4; the information requested in Sections 3.5 may be presented here or in Section 5; and the information requested in Sections 3.6 may be presented here or in Section 7.)

3.2 The sampling strategy shall be included and evidence must be presented to demonstrate that the strategy is appropriate for meeting primary project objectives, *i.e.*, a description of the statistical method or scientific rationale used to select sample sites and number of samples shall be provided.

3.3 Sampling/monitoring points for all measurements (*i.e.*, including locations and access points) shall be identified.

3.4 The frequency of sampling/monitoring events, as well as the numbers for each sample type and/or location shall be provided, including QC and reserve samples.

3.5 All measurements (*i.e.*, analytical [chemical, microbiological, assays], physical, and process) shall be identified for each sample type or process, and project-specific target analytes shall be listed and classified as critical or noncritical in the QAPP.

3.6 The planned approach (statistical and/or non-statistical) for evaluating project objectives shall be included.

SECTION 4.0, SAMPLING PROCEDURES

4.1 Whenever applicable, the method used to establish steady-state conditions shall be described.

4.2 Known site_specific factors that may affect sampling/monitoring procedures shall be described.

4.3 Any site preparation needed prior to sampling/monitoring shall be described.

4.4 Each sampling/monitoring procedure to be used shall be discussed or referenced. If compositing or splitting samples, those procedures shall be described.

4.5 For samples requiring a split sample for either QA/QC purposes or for shipment to a different laboratory, the QAPP shall identify who is responsible for splitting samples, and where the splitting is performed (*e.g.*, field versus lab).

4.6 If sampling/monitoring equipment is used to collect critical measurement data (*i.e.*, used to calculate the final concentration of a critical parameter), the QAPP shall describe how the sampling equipment is calibrated, the frequency at which it is calibrated, and the acceptance criteria for calibration or calibration verification, as appropriate.

4.7 If sampling/monitoring equipment is used to collect critical measurement data, the QAPP shall describe how cross-contamination between samples is avoided.

4.8 The QAPP shall include a discussion of the procedures to be used to assure that representative samples are collected

4.9 A list of sample quantities to be collected, and the sample amount required for each analysis, including QC sample analysis, shall be specified.

4.10 Containers used for sample collection, transport, and storage for each sample type shall be described.

4.11 Describe how samples are uniquely identified.

4.12 Sample preservation methods (*e.g.*, refrigeration, acidification, *etc.*), including specific reagents, equipment, and supplies required for sample preservation shall be described.

4.13 Holding time requirements shall be noted.

4.14 Procedures for packing and shipping samples shall be described.

4.15 Procedures to maintain chain_of_custody (*e.g.*, custody seals, records) during transfer from the field to the laboratory, in the laboratory, and among contractors and subcontractors shall be described to ensure that sample integrity is maintained.

4.16 Sample archival requirements for each relevant organization shall be provided.

SECTION 5.0, TESTING AND MEASUREMENT PROTOCOLS

5.1 Each measurement method to be used shall be described in detail or referenced. Modifications to EPA approved or similarly validated methods shall be specified.

5.2 For unproven methods, verification data applicable to expected matrices shall be included in the QAPP meaning the QAPP shall provide evidence that the proposed method is capable of achieving the desired performance.

5.3 For measurements which require a calibrated system, the QAPP shall include specific calibration procedures applicable to each project target analyte, and the procedures for verifying both initial and continuing calibrations(including frequency and acceptance criteria, and corrective actions to be performed if acceptance criteria are not met).

SECTION 6.0, QA/QC CHECKS

6.1 At a minimum, the QAPP shall include quantitative acceptance criteria for QA objectives associated with accuracy, precision, detection limits, and completeness for critical measurements (process, physical, and analytical, as applicable) for each matrix.

6.2 Any additional project-specific QA objectives shall be presented, including acceptance criteria. This includes items such as mass balance requirements.

6.3 The specific procedures used to assess all identified QA objectives shall be fully described.

6.4 The QAPP shall list and define all other QC checks and/or procedures (*e.g.*, blanks, surrogates, controls, *etc.*) used for the project, both field and laboratory.

6.5 For each specified QC check or procedure, required frequencies, associated acceptance criteria, and corrective actions to be performed if acceptance criteria are not met shall be included.

SECTION 7.0, DATA REPORTING , DATA REDUCTION , AND DATA VALIDATION

7.1 The reporting requirements (*e.g.*, units, reporting method [wet or dry]) for each measurement and matrix shall be identified.

7.2 The deliverables expected from each organization responsible for field and laboratory activities shall be listed.

7.3 Data reduction procedures specific to the project, and also specific to each organization, shall be summarized.

7.4 Data validation procedures specific to each organization used to ensure the reporting of accurate project data to internal and external clients shall be summarized.

7.5 Data storage requirements for each organization shall be provided.

7.6 The product document that will be prepared for the project shall be specified (*e.g.*, journal article, final report, *etc.*). The contents of this document can be referenced to a NHSRC or program-specific QMP, if appropriate.

SECTION 8.0, ASSESSMENTS

8.1 The QAPP shall identify all scheduled audits (*i.e.*, both technical system audits [TSAs] and performance evaluations [PEs]) to be performed, who will perform these audits, and who will receive the audit reports.

8.2 The QAPP shall provide procedures that are to be followed that will ensure that necessary corrective actions will be performed.

8.3 The responsible party(-ies) for implementing corrective actions shall be identified.

SECTION 9.0, REFERENCES

References shall be provided either in the body of the text as footnotes or in a separate section.

Attachment # 2

NHSRC QA
To the Statement of Work
Requirements/Definitions List

EPAs Quality System Website: http://www.epa.gov/quality
EPA's Requirements and Guidance Documents: http://www.epa.gov/quality/qa_docs.html
EPA's Quality System Website: http://www.epa.gov/quality/qs-docs/r5-final.pdf

In accordance with EPA Order 5360.1 A2, conformance to ANSI/ASQC E4 must be demonstrated by submitting the quality documentation described herein. All Quality documentation shall be submitted to the Government for review. The Government will review and return the quality documentation, with comments, and indicate approval or disapproval. If the quality documentation is not approved, it must be revised to address all comments and shall be resubmitted to the Government for approval. Work involving environmental data collection, generation, use, or reporting shall not commence until the Government has approve the quality documentation. The Quality Assurance Project Plan (QAPP) shall be submitted to the Government at least thirty (30) days prior to the beginning of any environmental data gathering or generation activity in order to allow sufficient time for review and revisions to be completed. After the Government has approved the quality documentation, the Contractor shall also implement it as written and approved by the Government.

NHSRC's Quality System Specifications for Extramural Actions –

These requirements typically pertain to single project efforts. The five specifications are:

(1) **a description of the organization's Quality System (QS) and information regarding how this QS is documented, communicated and implemented;**
(2) **an organizational chart showing the position of the QA function;**
(3) **delineation of the authority and responsibilities of the QA function;**
(4) **the background and experience of the QA personnel who will be assigned to the project; and**
(5) **the organization's general approach for accomplishing the QA specifications in the SOW.**

NHSRC QA Requirements/Definitions List
Category Level Designations (determines the level of QA required):

☐ **Category I Project** - applicable to studies performed to generate data used for enforcement activities, litigation, or research project involving human subjects. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category II Project** - applicable to studies performed to generate data used in support of the development of environmental regulations or standards. The QAPP shall address all elements listed in "EPA Requirements for QA Project Plans, EPA QA/R-5.

☐ **Category III Project** - applicable to projects involving applied research or technology evaluations. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP: QAPP** requirements for the specific project type (see below).

☐ **Category IV Project** - applicable to projects involving basic research or preliminary data gathering activities. The QAPP shall address the applicable sections of "EPA Requirements for QA Project Plans, EPA QA/R-5 as outlined in the **NHSRC's QMP QAPP** requirements for the specific project type (see below).

Project Types:

These outlines of NHSRC's QAPP Requirements for various project types, from Appendix B of the NHSRC QMP (except where otherwise noted), are condensed from typically applicable sections of R-5 (EPA Requirements for QA Project Plans) and are intended to serve as a starting point when preparing a QAPP. These lists and their format may not fit every research scenario and QAPP's must conform to applicable sections of R-5 in a way that fully describes the research plan and appropriate QA and QC measures to ensure that the data are of adequate quality and quantity to fit their intended purpose.

☐ **Applied Research Project** - pertains to a study performed to generate data to demonstrate the performance of accepted processes or technologies under defined conditions. These studies are often pilot- or field-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Applied Research Projects" from Appendix B of the NHSRC QMP.

☐ **Basic Research Project** - pertains to a study performed to generate data used to evaluate unproven theories, processes, or

technologies. These studies are often bench-scale. The QAPP shall address all requirements listed in "QAPP Requirements for Basic Research Projects" from Appendix B of the NHSRC QMP.

☐ **Design, Construction, and/or Operation of Environmental Technology Project** - pertains to environmental technology designed, constructed and/or operated by and/or for EPA. The QAPP shall address requirements in the EPA Quality System document "Guidance on Quality Assurance for Environmental Technology Design, Construction, and Operation" G-11, at http://www.epa.gov/quality/QS-docs/g11-final-05.pdf. For additional information, you may refer to Part C of "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology," ANSI/ASQC E4-1994, American Society for Quality Control, Milwaukee, WI, January 1995.

☐ **Geospatial Data Quality Assurance Project** - pertains to data collection; data processing and analysis; and data validation of geospatial applications. The QAPP shall address requirements in the EPA Quality System document "Guidance for Geospatial Data Quality Assurance Project Plans" G-5S at http://www.epa.gov/quality/QS-docs/g5g-final-05.pdf.

☐ **Method Development Project** - pertains to situations where there is no existing standard method, or a standard method needs to be significantly modified for a specific application. The QAPP shall address all requirements listed in "QAPP Requirements for Method Development Projects" from Appendix B of the NHSRC QMP.

☐ **Model Development Project** - includes all types of mathematical models including static, dynamic, deterministic, stochastic, mechanistic, empirical, etc. The QAPP shall address requirements in the EPA Quality System document "Guidance for Quality Assurance Project Plans for Modeling" G-5M at http://www.epa.gov/quality/QS-docs/g5m-final.pdf.

☐ **Sampling and Analysis Project** - pertains to the collection and analysis of samples with no objectives other than to provide characterization or monitoring information. The QAPP shall address all requirements listed in "QAPP Requirements for Sampling and Analysis Projects" from Appendix B of the NHSRC QMP.

☐ **Secondary Data Project** - pertains to environmental data collected from other sources, by or for EPA, that are used for purposes other than those originally intended. Sources may include: literature, industry surveys, compilations from computerized databases and information systems, and computerized or mathematical models of environmental processes. The QAPP shall address all requirements listed in "QAPP Requirements for Secondary Data Projects" from Appendix B of the NHSRC QMP.

☐ **Software Development and Data Management Project** - pertains to software development, software/hardware systems development, database design and maintenance, data validation and verification systems. The QAPP shall address all requirements listed in "QAPP Requirements for Software Development Projects" from Appendix B of the NHSRC QMP.

Definitions:

Environmental Data - These are any measurement or information that describe environmental processes, location, or conditions; ecological or health effects directly from measurements, produced from software and models, and compiled from other sources such as data bases or the literature. For EPA, environmental data include information collected directly from measurements, produced from software and models, and compiled from other sources such as data bases or literature.

Incremental Funding - Incremental funding is partial funding, no new work.

Quality Assurance (QA) - Quality assurance is a system of management activities to ensure that a process, item, or service is of the type and quality needed by the customer. It deals with setting policy and running an administrative system of management controls that cover planning, implementation, and review of data collection activities and the use of data in decision making. Quality assurance is just one part of a quality system.

Quality Assurance Project Plan (QAPP) - A QAPP is a document that describes the necessary quality assurance, quality control, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria. A QAPP documents project-specific information.

Quality Control (QC) - Quality control is a technical function that includes all the scientific precautions, such as calibrations and duplications, which are needed to acquire data of known and adequate quality.

Quality Management Plan (QMP) - A QMP is a document that describes an organization's/program's quality system in terms of the organizational structure, policy and procedures, functional responsibilities of management and staff, lines of authority, and required interfaces for those planning, implementing, documenting, and assessing all activities conducted. A QMP documents the overall organization/program, and is primarily applicable to multi-year, multi-project efforts. An organization's/program's QMP shall address all elements listed in the "Requirements for Quality Management Plans" in Appendix B of the NHSRC QMP.

Quality System - A quality system is the means by which an organization manages its quality aspects in a systematic, organized manner and provides a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance and quality control activities.

R-2. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r2-final.pdf.

R-5. EPA Requirements for Quality Management Plans (EPA/240/B-01/002) March, 2001 http://www.epa.gov/quality/QS-docs/r5-final.pdf.

Substantive Change - Substantive change is any change in an activity that may alter the quality of data being used, generated, or gathered.

Technical Lead Person (TLP) - This person is technically responsible for the project. For extramural contract work, the TLP is typically the contracting officer's representative (COR). For intramural work, the TLP is typically the Principal Investigator.

Abbreviations:

COR	Contracting Officer's Representative	IAG	Interagency Agreement
NHSRC	National Homeland Security Research Center	QA	Quality Assurance
NRMRL	National Risk Management Research Laboratory	QAM	Quality Assurance Manager
QA ID	Quality Assurance Identification	QMP	Quality Management Plan
QAPP	Quality Assurance Project Plan	SOW	Statement of Work
QS	Quality System	CRADA	Cooperative Research & Development Agreement
TLP	Technical Lead Person		

Attachment #2 to the Statement of Work
Revision 1. March 2006
NHSRC 06/02

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-40

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Mobile Monitoring to Quantify
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period:	Cost/Fee:	LOE:
04/01/2009 To 09/30/2014		
This Action:		
Total:		

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Richard Baldauf (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-4386 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)		Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)		Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates (Signature)	3-27-14 (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Statement of Work WA 5-40

Mobile monitoring to quantify the impacts of roadside vegetation on near-road air quality

1.0 Background:

Recent research by the EPA shows that roadway design, including the presence of vegetation, can alter concentrations of traffic-generated pollutants away from the road. Field study measurements have been collected under previous studies to determine associations among vegetation and near-road air quality. In addition, studies have been conducted quantifying how solid barriers affect near-road pollutant transport and dispersion. From these studies, model algorithms have been developed. In addition, these model algorithms have also been evaluated for potential use in describing near-road pollutant transport in the presence of vegetation barriers. The goal of this project is to evaluate and refine the vegetation model algorithm through collection of independent field data and comparing the RLINE model algorithm.

2.0 Task and Method Overview

The contractor shall execute a one (1) month field monitoring study to measure particulate matter (PM), nitrogen dioxide (NO_2), and carbon monoxide (CO) on and near a large highway with and without roadside vegetation (or alternatively before and after the planting of a vegetation stand). This field study will be conducted over a continuous one month period during the summer of 2014 at sites to be selected by the WA COR with assistance from the contractor as described below.

This study will include the deployment of mobile monitoring vehicles equipped with air monitoring and meteorology equipment. The all-electric vehicle shall be deployed to conduct real-time mapping of PM, NO_2, and CO by repeatedly driving a specified route at the study site. An SUV equipped with similar PM, NO_2, and CO instruments will be parked and sampled at a fixed location using on on-board battery pack system. The SUV sampling location may be moved during the study. A portion of the study site will also be further investigated using portable backpack and fixed-site sampling for PM parameters. The vehicle and portable sampling equipment are already on the ARCADIS contract and available for use in this study – the Geospatial Monitoring of Air Pollution (GMAP) electric car to support real-time air pollution mapping, two backpack systems equipped with sampling inlets and measurement instruments, and portable box samplers equipped with sampling inlets, instruments, and temperature control features. EPA will also provide a trailer to transport the GMAP vehicle to and from the site in Detroit, if deemed necessary by the WA COR.

The monitoring data will be compared to modeling results using the RLINE dispersion model, with inputs from MOVES. The RLINE model will be run using the algorithms developed for assessing solid and vegetative barriers. Model results will be compared to

the monitoring results. The vegetative barrier algorithm will be modified as appropriate based on the results of the field study and consultation with the EPA WA COR.

3.0 Description of Tasks:

Task 1. Site Selection and Preparation:

The contractor shall provide a list of recommended sites for this study, which may include locations with existing roadside vegetation barriers and sites with planned installation of roadside vegetation. After selection of a site in consultation with the EPA WA COR, the contractor shall visit the selected monitoring sites in coordination with EPA personnel as required for the purpose of evaluating field sampling deployments. Final site selection will be determined by the EPA WA COR.

Task 2. Technical Support for the Backpack and Portable Samplers

The backpack sampling systems are specially customized to support mobile monitoring of air pollutant concentrations on foot. The portable fixed-site systems allow easily relocateable stationary sampling. These systems utilize hand-held monitoring equipment and GPS capabilities into an integrated system capable of mapping spatial distributions of pollutant concentrations. Contractor support shall provide general backpack, portable fixed-site, and equipment support and transportation/shipment to the field sites. The contractor shall update and implement the standard operating procedures (SOP) for field deployment involving these systems. The SOPs include equipment descriptions and operations, backpack setup and maintenance, instrument calibration and maintenance, data storage, and data retrieval. The contractor shall also provide support in converting raw data files from the backpack sampling instruments into Excel spreadsheets. Contractor support shall also adhere to applicable Quality Assurance Project Plans (QAPPs).

Deliverable 2.1: Contractor shall submit a list of proposed study locations for the vegetative barrier field study

Deliverable 2.2: Contractor shall submit an updated SOP for the use of the backpack sampling systems in Tampa and Detroit to the EPA WA COR prior to initiating field measurements

Task 3. Technical and Safety Support for the Electric Vehicle and SUV

The GMAP vehicle is an electric vehicle specially customized to support onboard sampling. Given its limited driving range and specialized design, contractor support shall provide general vehicle support and vehicle transportation to field sites. The contractor shall update and implement the safety plan for field deployment activities involving the GMAP vehicle as well as the SUV used for both GMAP transport and field sampling. The safety plan was developed for previous studies, and includes emergency response protocols in the event that the GMAP vehicle loses power while driving on a highway or arterial road. In addition, a multi-year technical support agreement is in place to ensure that the vehicle manufacturer will provide on-site troubleshooting in the event of significant vehicle performance issues during a field campaign.

Deliverable 3.1: Contractor shall submit an updated GMAP vehicle safety plan for the field study to the EPA WA COR prior to initiating field measurements and provide general vehicle support.

Deliverable 3.2: Contractor shall provide a signed agreement for technical support from the GMAP vehicle manufacturer through at least three months after the proposed completion date for this project in the contractor's project workplan, to be completed prior to initiating field measurements. This agreement shall include in-person support during domestic deployments.

Task 4. Mobile Monitoring Instrumentation Support

The contractor shall conduct mobile monitoring instrumentation support activities prior to deployment to the field, including measurement inter-comparison tests, instrument calibration and maintenance, and development work to improve measurement accuracy. These work activities include, but are not limited to, inter-comparison activities for a one-week period of monitoring instrumentation sampling while on-board the mobile monitoring vehicles in motion and during fixed sampling. No environmental data collection with this instrument shall begin without an approved addendum.

Deliverable 4.1: The contractor shall provide raw timestamped inter-comparison data to the EPA WA COR, within one week of sampling completion.

Deliverable 4.2: The contractor shall provide quality assured, timestamped inter-comparison data, including any necessary post-processing, to the EPA WA COR within two months of inter-comparison sampling completion.

Task 5. Field Measurements:

The contractor shall execute a four-week field monitoring study at a location to be determined in the US to measure air quality near a major roadway under various configurations (vegetation and clearing features). Field sampling shall be conducted for approximately 4 hours each day, overlapping morning and/or afternoon commute periods. In addition to the monitoring period, transportation, set-up, break-down, and data storage are estimated to take approximately 4 hours per sampling day. The field sampling configurations and quality assurance requirements are described in an approved Category III QAPP which will be provided by the EPA WA COR with assistance from the contractor. This QAPP shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page. Work involving environmental data shall not commence until the QAPP has received official approval from the EPA Quality Assurance Staff. In the event that inclement weather or other unavoidable circumstances prevent field

sampling, a sampling day may be cancelled and rescheduled to meet the target of 24 sampling days for the study.

Each sampling day, the contractor will be responsible for transporting all vehicles and equipment to and from the site. The contractor will identify an appropriate site for vehicle and equipment storage and re-charging within a 20-mile radius of the project site. The contractor shall prepare for and conduct measurements of PM, NO_2, and CO onboard the electric monitoring vehicle and SUV, as well as PM from the backpack and fixed site sampling systems. In addition to the collection of air monitoring data, the contractor shall also prepare for and collect local meteorology measurements throughout each sampling period and document roadway properties. The contractor shall also collect video of highway and any adjacent road activities for the electric vehicle during mobile data collection. The field sampling campaign will be manned with personnel with sufficient expertise to ensure a minimum 80% completeness Data Quality Objective, as described in the QAPP.

Deliverable 5.1: The contractor shall provide raw timestamped concentration and meteorology data to the EPA WA COR (e.g. upload to a shared file folder or e-mailed to the EPA WA COR) within 3 days of data collection. The data to be reported and formatting will be described in the QAPP.

Deliverable 5.2: The contractor shall provide a complete data package (DP) for the study within 4 weeks of field monitoring completion. The DP shall include field notes, quality-assured field data, in-field quality indicators, calibration checks (to be outlined in the QAPP), and video. No contractor-generated report will be required as a deliverable.

Task 6. Air Quality Modeling:

The contractor shall use the results of the field measurements to evaluate the adequacy of the barrier algorithm for estimating the impacts of vegetative barriers on dispersion of pollutants near roadways. Based on results of the evaluation, the contractor shall modify model algorithms to account for the effects of vegetative barriers.

Specifically, the contractor shall implement the vegetation barrier algorithm into the RLINE model, test it, make modifications as necessary, and compare model results with field study data as follows:

- Prepare model inputs (including source configurations, meteorological characterizations and model receptors) for simulating the test periods of vegetative/porous barrier field measurements, including but not limited to the following near-roadway studies: Wind Tunnel (data will be provided by EPA), Mebane (data will be provided by EPA), Chapel Hill (data will be provided by EPA), Detroit (collected under WA2-40) and new field study (task 5).
- Obtain traffic data from the state or local transportation agency for the highway segment adjacent to the study site, including total traffic volume, average speeds and vehicle classifications, preferably at 15-minute averages

- Perform model simulations using the RLINE dispersion model and the inputs for the studies identified in this task above
- Process RLINE model output files for comparison with field measurements from the studies identified in this task above
- Compare modeled and measured concentrations for the solid and vegetative/porous barrier cases
- Calculate model performance metrics such as bias, standard deviation, and geometric mean as functions of downwind distance, and meteorological parameters (stability, u-star, and wind speed)
- Test and modify parameterizations in barrier algorithm based on barrier height, distance between roadway and barrier, porosity, vegetation type, and meteorological parameters (e.g. u-star and surface roughness)
- Implement modifications to the barrier algorithm methodology into RLINE using FORTRAN

Deliverable 6.1: The contractor shall provide a database of model inputs for the field studies to be evaluated (historical and work done under this WA)

Deliverable 6.2: The contractor shall provide model outputs for all RLINE calculations

Deliverable 6.3: The contractor shall provide a description and model code for the vegetation barrier algorithm

Deliverable 6.4: The contractor shall provide a summary report of model vs. measurement results for the field studies evaluated that includes a list of field studies evaluated (including the work under this WA), model inputs used, and comparison of results

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-42

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Charactarization and Control o

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

SFO (Max 2): ☐

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Contract Period: 04/01/2009 To 09/30/2014	Cost/Fee:	LOE:
This Action:			
Total:			

Work Plan / Cost Estimate Approvals

Contractor WP Dated:	Cost/Fee:	LOE:
Cumulative Approved:	Cost/Fee:	LOE:

Work Assignment Manager Name: Chun-Wai Lee (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-7663 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-25-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Statement of Work
For WA 5-42 (FY 2014)

Characterization and Control of Emissions from Oxy-Coal Combustion

Project Description:

Oxygen enrich coal (oxy-coal) combustion as applied to utility coal boilers essentially involves process modifications to remove ~80% of volumetric input flow (nitrogen) so as to produce a concentrated CO_2/H_2O exhaust amenable to further processing, compression, and sequestration. There is very little information on how pollutant species such as sulfur, fuel nitrogen, ash, metals, Hg, potential organic hazardous air pollutants (HAPs), etc. will behave and be transformed under the unique conditions of oxy-coal combustion and also the effects of this unique environment on the performance of existing pollution control devices. These transforming pollutant species are likely to affect the operation of different boiler and pollution control systems in both adverse and perhaps beneficial ways. Further, emissions that would normally escape controls and be released as air emissions (O_2, SO_2, SO_3, NO, NO_2, ultrafine ash and metals, Hg, Se, and organic HAPs) now may be compressed and sequestered with the CO_2 and affect its chemistry during transport and in geological storage. In this project, the effect of oxy-coal combustion on the formation and behavior of these pollutants and the effect of this environment on the performance of existing pollution control devices will be investigated.

There is also a significant lack of understanding regarding the environmental issues associated with the CO_2 compression process following the oxy-combustion. Key questions include: (1) what flue gas components, compositions, and concentrations can be processed by compression and purification units (CPUs) and what additional pretreatment is required; (2) how do flue gas species partition to the various CPU effluents; (3) how do process changes on the combustion side affect CPU operation and partitioning; (4) what purity of CO_2 produced from the CPU is required to ensure safe, very long-term, geologic sequestration; and (5) is it possible for trace levels of impurities (such as oxygen, nitrogen, argon, acids, particles, metals, CO, organics, etc.) to be compressed and sequestered with the CO_2? Air Liquide, a leading industrial gas provider, has developed a compression and purification technology concept to capture, compress, and purify CO_2 generated from the oxy-coal combustion process for sequestration purposes. The process is designed to process the CO_2-enriched flue gas generated from the oxy-coal combustion process through compressing and condensing CO_2 to separate it from other condensable and non-condensable flue gas components for pipeline transportation and geologic sequestration. The multi-stage compression and purification unit (CPU) process can also separate pollutants and impurities from the flue gas. In contrast to existing conventional coal-fired power plants, this process has the potential to produce near zero emissions of air pollutants. APPCD and Air Liquide are collaborating on their experimental research efforts for evaluating the potential of CPU technologies to reduce pollutants from oxy-coal combustion under a Cooperative Research and Development Agreement with EPA (CRADA). The objectives of research are: to examine different flue gas conditioning and CPU configurations options, and how these affect partitioning, emissions, and potential CO_2 purity and; to validate the efficiency of various CPU process parameters to partition and remove pollutant species (SOx, NOx, Hg, PM, H_2O, CO, organic VOCs, etc.

Tests shall be conducted on APPCD's two existing combustion research facilities, the drop tube furnace and the Innovative Furnace Reactor (IFR). The drop tube furnace is a bench-scale system designed to study coal combustion under a well controlled environment. The pilot scale, refractory-lined, down-fired furnace (150,000 Btu/hr nominal firing rate) which has been used to generate a coal combustion environment and flue gas cooling conditions similar to those of coal-fired utility boilers. The IFR is equipped with an electrostatic precipitator (ESP) for particulate matter (PM) control. Tests will be performed on this facility to evaluate the emissions and control from oxy-coal combustion. The IFR has been modified for firing natural gas and coal under simulated O_2 and CO_2 enrich conditions similar to those of oxy-natural gas and oxy-coal firing boilers currently under development by the industry. Recirculation of flue gas in the modified IFR's flue gas ductwork, is proposed in the testing of this WA. A laboratory scale CO_2 CPU unit which is compatible with the IFR combustion research facility will be designed and installed in cooperation with Air Liquide.

Objective:

The primary objective of this project is to investigate the transformation of air pollutants under simulated oxy-coal and oxy-natural gas firing conditions. The effects of this unique combustion environment on the performance of existing air pollution control devices such as FF and ESP, wet scrubber, and SCR, will be evaluated. The potential of the CPU technology to remove pollutants produced under oxy-coal and oxy-natural gas combustion conditions will also be assessed.

Approach:

The IFR shall be operated under flue gas recirculation with PM control for simulating firing conditions similar to those of the oxy-coal firing boilers currently under development. The objective shall be to achieve greater than 80% CO_2 concentration in the flue gas measured at the outlet of the furnace. Coal combustion flue gases have much significantly higher SO_2 concentration and low moisture content than those of natural gas combustion flue gases. The moisture content in the re-circulated combustion flue gas generated by the IFR shall be reduced substantially by passing the flue gas through a moisture condenser followed by an electric re-heater.

The coals tested in the project shall be identified and selected from commercial suppliers. Initial effort of the tests shall be focused on those coals which have been tested by major oxy-coal combustion organizations from academia and industry.

Statement of Work:

TASK 1. Work Plan, Reporting, Budget, And WA Management

The contractor shall prepare and deliver to the WA manager (WAM) a work plan and budget within 20 days of WA effective date. The work plan shall include a description of how the contractor shall accomplish each task, along with a breakdown, per task, level of effort by professional level, a cost breakdown, and any underlying assumptions used. The contractor shall conduct activities necessary to manage the WA, including at least weekly communication with the EPA WAM. When responding to this WA, the contractor shall assume the primary responsibility to operate the IFR. The contractor shall update the existing Quality Assurance Project Plan

(QAPP) under the direction of the WAM as specified in Attachment #1. Work involving environmental data shall not commence until the QAPP has received official approval from the EPA Quality Assurance Staff. The contractor shall comply with all requirements as delineated on Attachment #1 to the SOW.

TASK 2 Drop Tube Furnace Experiments

Experimental studies shall collect and analyze gas and particle emissions as a function of oxy-coal operating parameters (O_2, CO_2, H_2O, and temperature). The contractor shall modify, maintain, operate, and make improvements to the existing drop tube furnace and provide all necessary hardware. The furnace shall include any instrumentation required to maintain safe and continuous operating conditions. A fuel and oxidant feed system as well as safety and control systems are also included. Operate the drop tube furnace according to design specifications and establish operating conditions for producing coal combustion aerosol. Characterize the physical and chemical characteristics of drop tube furnace emissions during combustion of pulverized coal. This characterization shall provide data that shall be used to set operating parameters, such as fuel and oxygen feed rates and corresponding exhaust gas characteristics. Quantities to be measured include air and coal feed rates, outlet gas temperature, particle size distribution, and mass emission rates, particle compositions, O_2, CO, NO_x, SO_2, H_2O, and CO_2 gas concentrations. The contractor shall provide support and expertise for sampling and characterization of inorganic and carbonaceous particulate matter emissions. The contractor shall deliver raw analytical data (computer files and data sheets) and reduced data in the form of Excel spreadsheets, pie charts, and graphs of the data collected for each experimental study.

TASK 3. IFR Experiments

Operation of the IFR

An existing QAPP shall be updated by the contractor for this particular Task. The contractor shall not begin data collection until the QAPP is approved by EPA Quality Assurance Staff. The contractor shall assist in the operation of the IFR. This shall include but not be limited to: natural gas, pulverizing coal, operating the IFR under air- and oxygen-firing modes including the associated air pollution equipment, removing ash and scrubber residue from the facility, and operation of the flue gas sampling system.

Flue Gas Sampling and Analysis

The contractor shall provide support and expertise in vapor-phase sampling for flue gas. This shall include, but not be limited to CO_2, CO, O_2, SO_2, NO_x and total hydrocarbon (THC) measurements taken with continuous emission monitors (CEMs). The contractor shall also provide support and expertise on sampling and characterization of other pollutants which shall be included but not limited to fly ash and metals, Hg, Se, As, and organic HAPs.

Effect of oxygen enriched combustion on PM emissions and VOC emissions

The contractor shall operate the IFR under oxy-coal firing mode for evaluating the effect of oxy-coal firing on the control of particulate matter (PM). A new electrostatic precipitator (ESP) has been installed recently to the IFR for removing PM from the flue gas in order for recycling most of the flue gas back to the IFR furnace. Flue gas recyling is essential in all oxy-combustion processes. The objective of this subtask is to evaluate the PM control efficiency of the ESP operated under different voltages and current conditions during oxy-coal combustion. The efficient control of PM is very important for the safe operation of the oxy-coal combustion process.

The contractor shall provide support and expertise for sampling PM simultaneously at both the inlet and outlet of the ESP using modified EPA Method 5. The contractor shall also provide support and expertise for the characterization of the PM passing through the inlet and outlet location of the ESP using on-line PM measurement instruments including scanning mobility particle analyzer/aerodynamic particle sizer (SMPS/APS) and the laser-based total PM analyzer made by SICK. The combustion conditions of all the PM control tests will be well characterized. This shall include, but not be limited to CO_2, CO, O_2, SO_2, and NO_x measurements taken with the continuous emission monitors (CEMs). The contractor shall also provide support and expertise on measurements of other specialty gases that are possibly presented in oxy-coal combustion such as N_2O and N_2.

The contractor shall operate the IFR under both oxy-natural gas and oxy-coal firing modes for evaluating the effect of oxygen enriched combustion on emissions of volatile organic compounds (VOCs). The objective of this sub-task is to characterize VOC emissions from both oxy-natural gas combustion and oxy-coal combustion under different IFR furnace operating conditions. The contractor shall provide support and expertise for sampling VOC emissions using the SUMMA canisters. The VOCs samples contained in the canisters will be analyzed using gas chromatography coupled with mass spectrometry (GC/MS) by the existing organic lab set up in the Emissions Characterization & Prevention Branch (ECPB) for measuring VOC emissions from different combustion sources. The contractor shall also provide support and expertise on sampling and characterization of other pollutants such as organic HAPs.

Maintenance and Repair of IFR Facility

The contractor shall provide the labor necessary to maintain and repair the IFR including the CPU with associated air pollution equipment and other auxiliary equipment. Examples include repairing glassware, calibrating nozzles, pitot tubes, dry gas meters (DGMs), tracking equipment inventories, etc. Conduct of specific actions will be approved in writing by the WAM prior to initiation of any identified support action.

Purchasing of Expendable Supplies

The contractor shall be responsible for purchasing general expendable supplies required to maintain operation of the IFR including the CPU. The WAM shall provide approval for any purchases related to the supplies listed below.

These supplies shall include, but not be limited to:

a) Calibration, supply and carrier gases for analytical systems
b) Valves, tubing and piping
c) Compression fittings
d) Coal and transportation of the coal to EPA's RTP, NC facility
e) Chemicals and reagents including hydrated lime for the wet scrubber
g) Sorbent tubes and other gas-sampling consumables

TASK 4. CPU Installation and Testing

The contractor shall provide technical support to APPCD in the collaborative CPU research with Air Liquide. This support shall include the construction and installation of a laboratory scale CO_2 CPU unit compatible with the IFR combustion research facility that will be used for conducting

experiments to evaluate pollutant and purification process effects in oxy-coal combustion systems. Detailed designs for the CPU are being provided by Air Liquide as part of a CRADA with EPA. EPA will purchase the large capital components and as many of the small components (valves, fittings, mass flow controllers, meters, etc.) as practical. The contractor shall coordinate through the WAM with Air Liquide for addressing technical issues associated with the compatibility of the CPU design and the IFR facility, and once the components are delivered, the contractor shall provide technical support to APPCD to assemble and install the laboratory scale CO_2 CPU and integrate the CPU with the IFR and its SCADA control system. APPCD will provide components and parts for CPU, which include but not limited to the compressor, environmental box, dryers, coolers, flow indicators and controllers, temperature flow indicators and controllers, tubing and fittings. The contractor shall assemble these components and integrate the CPU within the IFR combustor and its SCADA control system following the design provided by Air Liquide. It is understood that while as many components as possible will be provided by EPA, there are likely to be numerous small components that will need to be customized and constructed on-site.

The contractor shall maintain strict control of all Confidential Business Information (CBI) provided by Air Liquide through the WAM for this task as it is required by Contract (EP-C-09-027) on handling of CBI by the contractor.

Reports of Work:

The contractor shall prepare a work plan and budget within 20 days of WA effective date. The contractor shall prepare and submit monthly reports in accordance with the terms and conditions of the contract.

The contractor shall prepare, as requested by WAM, data summary, project progress reports, briefing materials, presentation for technical meetings/conferences, and paper submitting to peer reviewed journals. The contractor shall coordinate with the WAM to ensure compliance with NRMRL/APPCD policies and guidelines concerning review and approval of technical papers and reports. Technical papers and presentations shall be co-authored with EPA researchers.

The contractor shall maintain at least weekly communications with the WAM. Additionally the contractor shall inform the PO and the WAM in writing when 75% of the total funds and/or hours contained in the work plan are expended.

Quality Assurance/Quality Control:

The contractor shall update the Quality Assurance Project Plan (QAPP) as required in Attachment #1 to the Statement of work for "Characterization and Control of Emissions from Oxy-Coal Combustion." After revision, the QAPP shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature

page. Any work involving environmental data shall not commence until the QAPP has received official approval from the EPA QA staff.

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-48

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014 Base Option Period Number 5	Cookstoves Performance and Emi

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [ ] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

Contract Period: 04/01/2009 To 09/30/2014 — Cost/Fee: — LOE:

This Action:

Total:

Work Plan / Cost Estimate Approvals

Contractor WP Dated: — Cost/Fee: — LOE:

Cumulative Approved: — Cost/Fee: — LOE:

Work Assignment Manager Name: Jim Jetter (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-4830 FAX Number:
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code: Phone Number: 919-541-3670 FAX Number:
Other Agency Official Name (Signature) (Date)	Branch/Mail Code: Phone Number: FAX Number:
Contracting Official Name: William Yates William Yates 3-27-14 (Signature) (Date)	Branch/Mail Code: Phone Number: 513-487-2055 FAX Number:

Work Assignment 5-48 (Extension)

Statement of Work

WA 5-48: Cookstoves Performance and Emissions Testing

OBJECTIVES

The primary purpose of this WA (work assignment) is to continue work performed under WA 4-48 to measure performance and air pollutant emissions from practical, fuel-efficient, "clean-burning" cookstoves. Pollutant emissions from "clean-burning" solid-fuel stoves shall be compared to emissions from the traditional "three-stone" fire, as well as to emissions from liquid- and gas-fueled stoves. This study provides stove emissions information that will be valuable to Global Alliance for Clean Cookstoves (the Alliance) partners disseminating stove technology in the field. Additionally, this study is exploring how cookstove performance and emissions are affected by conditions including fuel moisture content, fuel size and shape, operator technique, weather conditions, pot size and shape, and stove durability. Results from this study will support the development of testing protocols and standards through ISO Technical Committee 285, Clean Cookstoves and Clean Cooking Solutions. This work also provides technical support for the development of Regional Testing and Knowledge Centers, many of which are sponsored by the Alliance.

BACKGROUND

This work is part of EPA's commitment in support of the Global Alliance for Clean Cookstoves. The Alliance was launched after ten years of foundational work conducted by the EPA-led Partnership for Clean Indoor Air (now integrated with the Alliance). The Alliance is a public-private partnership that seeks to save lives, improve livelihoods, empower women, and protect the environment by creating a thriving global market for clean and efficient household cooking solutions. Its ambitious goal is to foster the adoption of clean cookstoves and fuels in 100 million households by 2020. For more information, see the Alliance web site at: http://www.cleancookstoves.org/

Air pollutant emissions from solid-fuel cookstoves are estimated to cause 4 million premature deaths annually – greater than the combined impact of HIV, malaria, and tuberculosis in developing countries. Cookstove emissions of black carbon, brown carbon, organic carbon, CO_2, and methane also affect global climate change.

Reducing problems associated with burning solid fuel indoors provides multiple benefits. Human health is improved through better indoor air quality and ambient air quality. Sustainability and ecology are promoted through reduced deforestation and protection of biodiversity. Global climate change is addressed through reduced emissions of greenhouse gases and other climate forcers. International relations are improved through collaboration with partners.

TEST PLAN

Continuation of support for data analysis:

The contractor shall continue to provide support for processing and analyzing data from the cookstove tests conducted under WA 4-48. The contractor shall work closely with the EPA WACOR. The contractor shall use DASYLab software for data acquisition and Microsoft Excel spreadsheets for processing data. Microsoft Access may be used in the future for managing data. The contractor-provided support shall include QA checks of manual data entry, importing raw data into "daily data" spreadsheets, importing processed data from "daily data" spreadsheets into "stove/fuel spreadsheets," evaluating carbon balance calculations, and final QA checks. The contractor shall identify tests that do not meet QA requirements, and repeat tests if necessary. This work is described in the revised QAPP and associated MOPs. The work will be coordinated with the EPA WACOR, and the EPA WACOR will provide further details.

Operation of facilities:

The contractor has completed a new cookstove test facility in the EPA High Bay Building (Room H-106) under WA 4-48. This new system is similar to the one previously used for testing cookstoves under WA 2-48, except the new system adds capability for testing stoves with tall chimneys. Figures 1-3 show three modes of operation for the new system. The contractor shall operate, maintain, and repair the facilities, as needed. EPA will provide instrumentation. The contractor shall provide continuous improvement of the system, as needed, to meet QA requirements, improve efficiency of operations, and improve general quality.

Stoves to be tested:

The EPA WACOR will obtain the stoves and will specify which stoves will be tested. The Contractor shall operate the stoves during the testing. Stoves to be tested will include the following types:

- Liquid- and gas-fueled stoves
- TLUD (top-lit up-draft) stoves
- Built-in-place plancha stoves
- Charcoal stoves
- Fan stoves
- Rocket stoves
- Institutional stoves
- Other biomass stoves

Total number of stove/fuel combinations to be tested: 40

Fuels to be tested:

Wood-burning stoves shall be tested with high- and low-moisture hardwood, red oak, fuel. Freshly cut "green" red oak firewood without bark, lengths approximately 14", will be obtained from a local vendor. The wood shall be cut on a table saw and/or band saw to produce sticks that shall be approximately 2 cm x 2 cm in cross section. Half of the fuel wood shall be air dried to a moisture content of approximately 10 percent (on a wet basis), and the other half of the fuel wood shall be stored in air-tight barrels in a freezer to keep the moisture content at approximately 30 percent.

The charcoal stoves shall be tested with "lump" charcoal (not compressed briquettes) similar to that available in developing countries. Stoves shall be tested with "dry" charcoal (approximately 5 percent moisture content on a wet basis). Charcoal shall be started (ignited) with 50 g of wood chips soaked in 10 grams of kerosene.

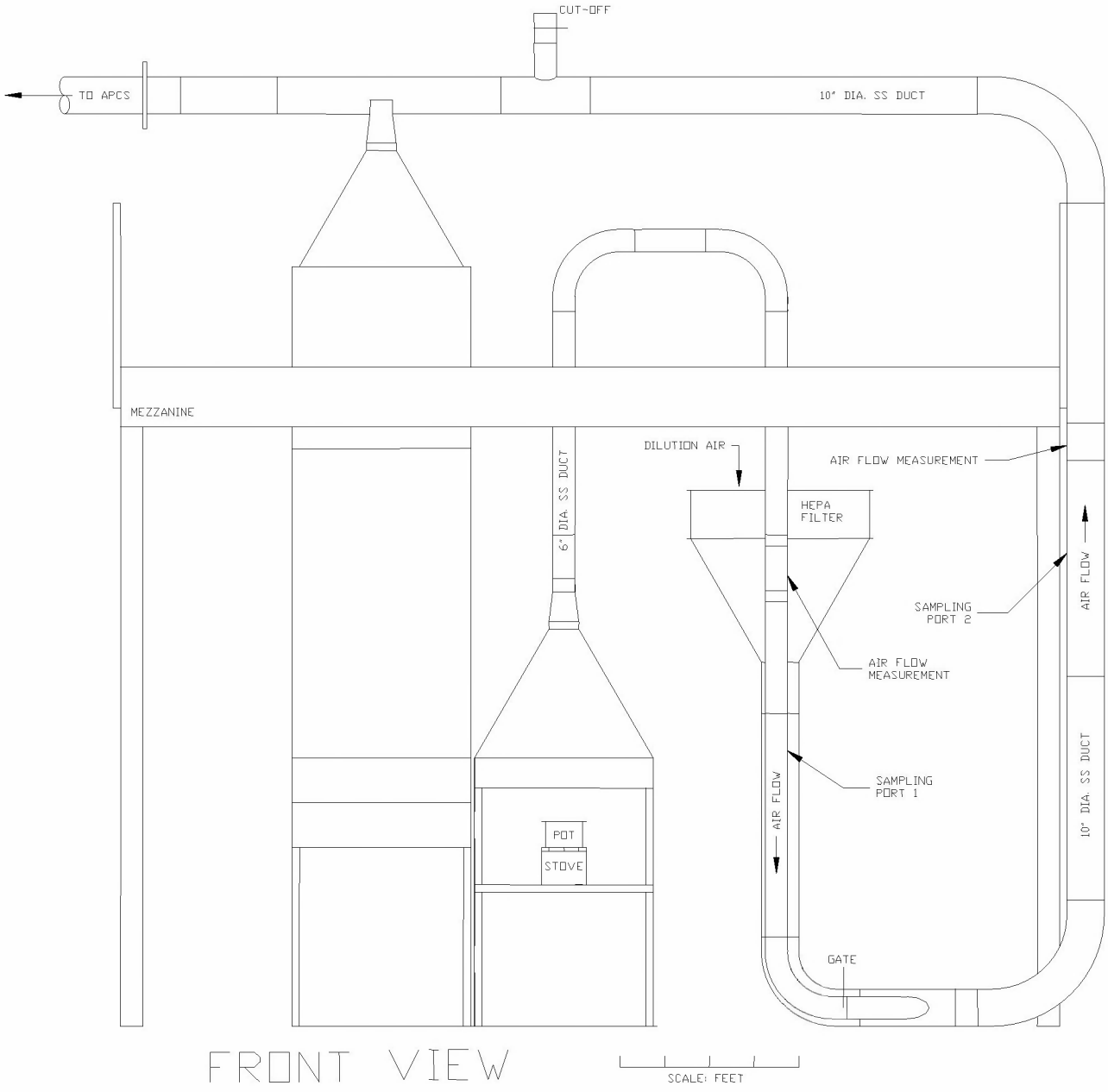

Figure 1. Mode 1: System configured for testing emissions from small cookstoves without chimneys

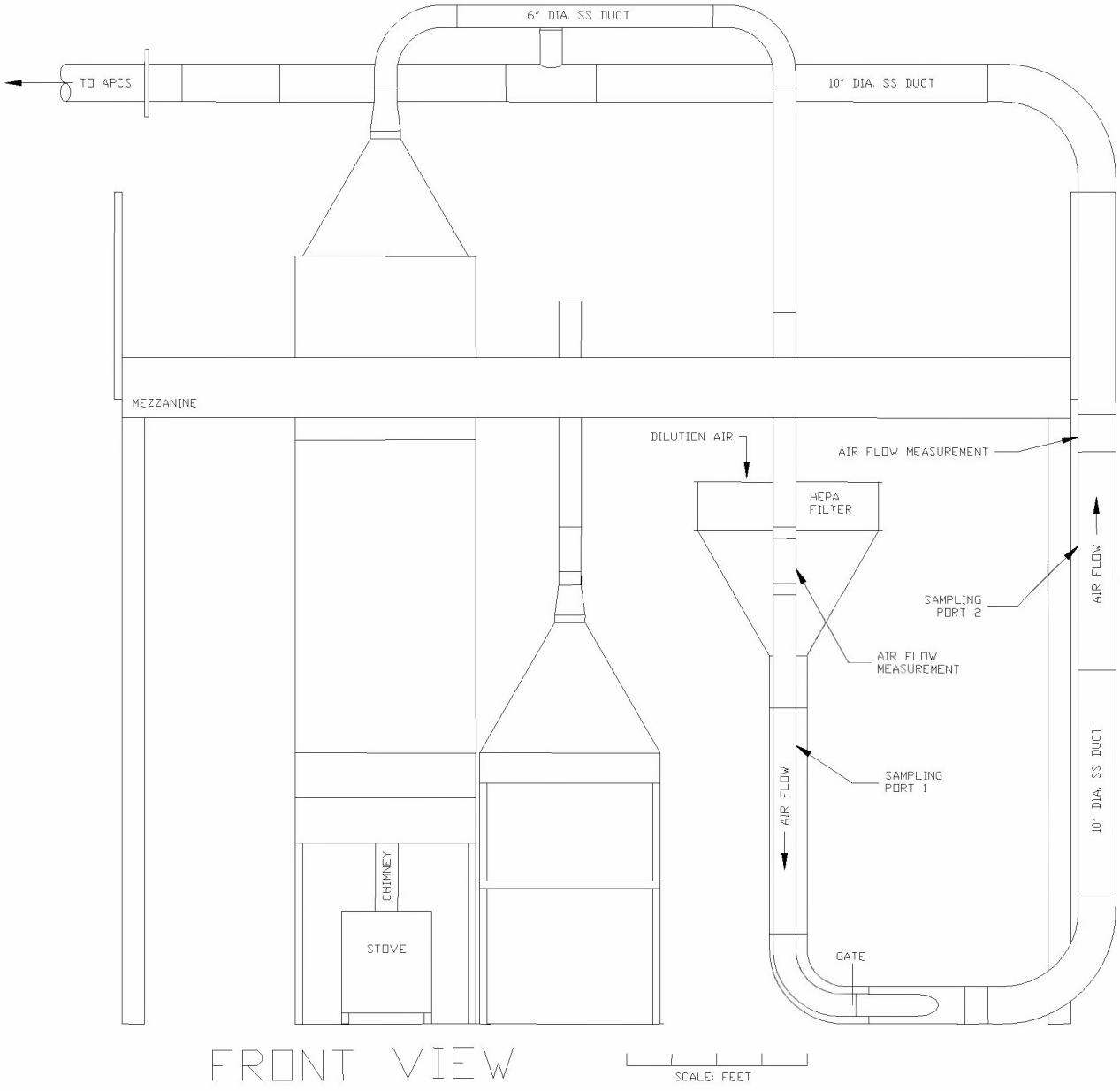

Figure 2. Mode 2: System configured for testing total emissions from stoves with chimneys

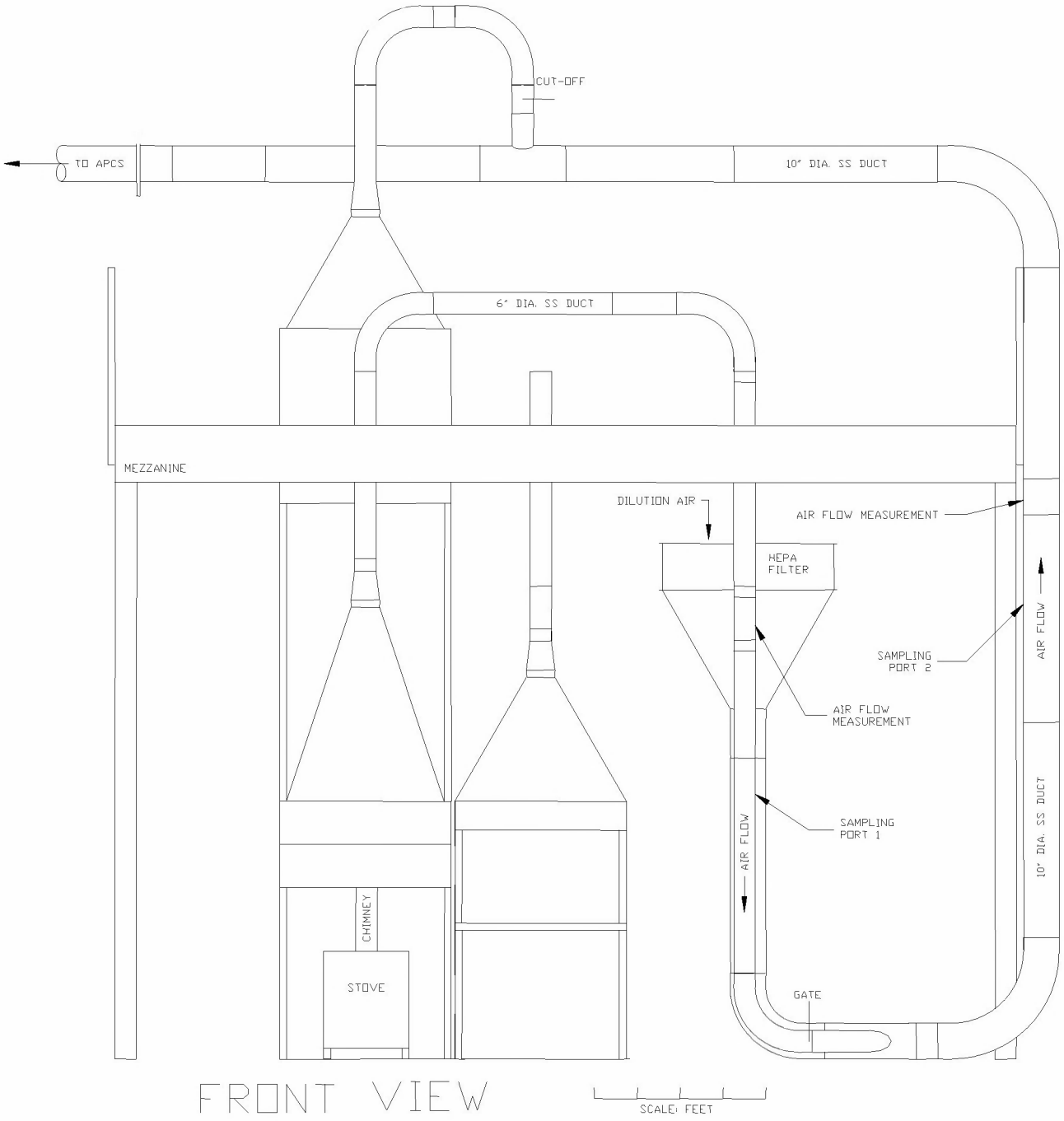

Figure 3. Mode 3: System configured for testing indoor air emissions from stoves with chimneys

All fuels shall be analyzed for moisture content using ASTM Standard Method D4442-07. Moisture content of the fuels shall be measured on each day of testing. A random sample of fuel wood, with a mass of approximately 100 g, shall be weighed with an electronic balance. The sample shall be dried in a ventilated oven for at least 8 hours, and then the sample shall be weighed again. The percent moisture content in the wood on a percent wet basis shall be calculated and recorded.

All fuels shall be analyzed for heat of combustion using ASTM Standard Method ASTM D5865-04. This testing shall be done by a qualified outside laboratory.

Air pollutants to be measured:
The contractor shall measure emissions of the following pollutants for each stove and fuel combination:

- CO_2 - real-time, CEM (IR)
- CO - real-time, CEM (IR)
- $PM_{2.5}$, measured gravimetrically, filter sample taken during each of the three phases of the WBT (Water Boiling Test – see below)
- BC (black carbon) – real-time with aethalometer
- EC (elemental carbon) and OC (organic carbon) – quartz filter sample taken during each of the three phases of the WBT and analyzed with the thermal-optical method. Quartz "back-up" filter sample also taken during each WBT phase to quantify the gas-phase artifact
- PM, submicrometer particles measured with SMPS (scanning mobility particle sizer)
- THC (total hydrocarbon) - real time, FID total HC analyzer
- CH_4 (methane) - real time, FID analyzer
- Other pollutants may be added if resources (instruments and personnel) are available

The EPA will furnish instrumentation and equipment necessary to measure air pollutants.

BC/EC/OC analysis will be provided by EPA Emissions Characterization and Prevention Branch, contact: Michael Hays

Test protocol:
WBT (Water Boiling Test) Version 4.2.2 available at:
http://www.cleancookstoves.org/our-work/standards-and-testing/learn-about-testing-protocols/

A summary of the performance test protocol follows:

"This modified version of the well-known Water Boiling Test (WBT) is a simulation of the cooking process that can be performed on most stoves in use throughout the world. While the test is not intended to replace other forms of stove assessment, it is designed to be a simple method by which stoves made in different places and for different cooking applications may be compared by a standardized and replicable protocol."

"The WBT …consists of three phases.

1) In the first phase, the tester begins with the stove at room temperature and uses a pre-weighed bundle of wood to boil a measured quantity of water in a standard pot. The tester then replaces the boiled water with a fresh pot of cold water to perform the second phase of the test.
2) In the second phase, water is boiled beginning with a hot stove in order to identify differences in performance between a stove when it is cold and when it is hot.
3) Lastly, the tester again boils a measured amount of water and then, using a pre-weighed bundle of wood, simmers the water at just below boiling for a measured period of time (45 minutes). The third step simulates the long cooking of legumes or pulses that is common throughout much of the world."

"This combination of tests is intended to measure the stove's performance at both high and low power outputs, which are important indicators of the stove's ability to conserve fuel."

Results

The contractor shall use the automated system that has been developed to enable immediate data processing following each stove test (not including analysis of samples that require post-processing, e.g., filter samples).

The contractor shall deliver data to the EPA WACOR in a format, such as Microsoft Excel, that can be easily analyzed. Results shall be reported as averages and standard deviations for the three tests for each stove. The contractor shall report data including all parameters in the WBT test protocol, and the data shall be in format similar to that used for WA 4-48.

Safety

The Contractor shall comply with a Health and Safety Protocol. The Contractor shall maintain a safe working environment during testing.

Quality Assurance

The contractor completed a QAPP (Level II) under WA 3-48, the QAPP was updated under WA 4-48, and work will continue under the existing QAPP. The contractor completed an internal technical systems audit, and the project was approved by an EPA internal quality assurance review. An internal audit of data quality was performed by the contractor under WA 4-48. If any revision of the QAPP (and associated MOPs) is required, the QAPP shall be reviewed and approved by the ARCADIS work assignment leader and QA officer. Once it has obtained their approval, it shall be submitted to the EPA QA staff for review and approval. It shall be accompanied by a signature page that is signed by the ARCADIS work assignment leader and QA officer to show that they have reviewed and approved the revised QAPP. It is the responsibility of the ARCADIS work assignment leader to document this process. Upon receipt of the signed QAPP, the EPA work assignment manager and QA manager will review and approve the QAPP and they will add their signatures to the signature page. Any work involving

environmental data shall not commence until the QAPP has received official approval from the EPA QA staff.

Reporting

The Contractor shall prepare and deliver brief, monthly progress reports in accordance with the reporting requirements in the contract. The contractor shall deliver data and filter samples to the EPA WACOR. The final report will be prepared by the EPA WACOR and will be in the form of EPA reports and a manuscript to be submitted to a peer-reviewed journal for publication. Contractor personnel may be coauthors of the publication.

Deliverables

Raw test data, filter samples, and processed data shall be deliverables.

Schedule is as follows:

July 30, 2014	Complete cookstove testing
August 30, 2014	Deliver all filter samples
September 30, 2014	Complete data analysis and quality assurance

EPA

United States Environmental Protection Agency
Washington, DC 20460

Work Assignment

Work Assignment Number: 5-09

☐ Other ☐ Amendment Number:

Contract Number	Contract Period	Title of Work Assignment/SF Site Name
EP-C-09-027	04/01/2009 To 09/30/2014	Open Area Emissions Testing
	Base Option Period Number 5	

Contractor: ARCADIS U.S., INC.

Specify Section and paragraph of Contract SOW:

Purpose:
- [X] Work Assignment
- [ ] Work Assignment Amendment
- [X] Work Plan Approval
- [ ] Work Assignment Close-Out
- [ ] Incremental Funding

Period of Performance: From 04/01/2014 To 09/30/2014

Comments:

☐ Superfund — Accounting and Appropriations Data — [X] Non-Superfund

SFO (Max 2): ☐

Note: To report additional accounting and appropriations date use EPA Form 1900-69A.

Line	DCN (Max 6)	Budget/FY (Max 4)	Appropriation Code (Max 6)	Budget Org/Code (Max 7)	Program Element (Max 9)	Object Class (Max 4)	Amount (Dollars)	(Cents)	Site/Project (Max 8)	Cost Org/Code (Max 7)
1										
2										
3										
4										
5										

Authorized Work Assignment Ceiling

	Cost/Fee	LOE
Contract Period: 04/01/2009 To 09/30/2014	$0.00	0
This Action:	$124,445.00	1,324
Total:	$124,445.00	1,324

Work Plan / Cost Estimate Approvals

	Cost/Fee	LOE
Contractor WP Dated: 04/20/2014	$124,445.00	1,324
Cumulative Approved:	$124,445.00	1,324

Work Assignment Manager Name: Brian Gullett (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-1534
	FAX Number:	
Project Officer Name: Kevin Sudderth (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	919-541-3670
	FAX Number:	
Other Agency Official Name (Signature) (Date)	Branch/Mail Code:	
	Phone Number:	
	FAX Number:	
Contracting Official Name: William Yates William Yates (Signature) 5-7-14 (Date)	Branch/Mail Code:	
	Phone Number:	513-487-2055
	FAX Number:	